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CONFERENCE ON TANK CONTAINERS

U.S.
DEPARTMENT
OF COMMERCE

Maritime
Administration



April 19, 1973

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U.S. DEPARTMENT OF COMMERCE
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CONFERENCE OBJECTIVES

Howard F. Casey

Deputy Assistant Secretary for Maritime Affairs

It is a great pleasure to welcome you to this seminar on tank container usage and design.

This is the second in a series of conferences designed to bring together leading representatives of American containership operators, shippers, equipment manufacturers, and concerned government agencies to discuss the present and future of specialized containers. The first such symposium dealt with refrigerated containers, and succeeding ones will cover, among other topics, the identification and marking of containers and the stowage of cargoes in containers for safe and efficient shipment.

Our purpose in sponsoring these conferences is to increase the use of containerization and similar intermodal shipping systems in U.S. foreign trade.

As those of you who follow trade developments closely are aware, the United States is entering a new era in international trade relations, one in which the prospects for increased trade will be greatly enhanced.

President Nixon, just last week, transmitted to Congress a request for new legislation that will bolster this nation's status as a major trading power. The proposed law would give to the President wide-ranging authority to negotiate agreements with other nations to lower both tariff and non-tariff barriers to trade.

Combined with the recent revaluations of the American dollar, this move will serve to expand U.S. exporting opportunities in the years ahead.

But the President has not limited his efforts to these broad endeavors. His historic trips to the Soviet Union and the Peoples Republic of China will open important new markets for American exporters and importers.

The commercial agreement with the Soviet Union could generate up to \$1.5 billion in trade between the U.S. and U.S.S.R. over its three-year life, if Congress approves the President's request to confer "most favored nation" status on the U.S.S.R.

Similarly, trade with China could also blossom in the next few years, as the President's overtures to that nation bear fruit. One particularly hopeful sign is the recent creation of a National Council for U.S.-China Trade in order to smooth the way for increased commercial relations between the U.S. and the Peoples Republic of China.

I believe that those of you who are intimately concerned with America's trading posture will agree that the future is definitely bright.

The current resurgence of America's shipping lines can also add to your trading ability. The last decade has seen American shipping lines pioneer and expand the concept of intermodal shipment in containers which offers significant benefits to shippers.

Containerization makes possible faster service, increased protection from cargo damage and pilferage, and more stable rates in an era of increasing prices throughout the world.

The United States government and the American transportation industry have invested on the order of \$7.5 billion in this development over the past 15 years, including ships, rail cars, chassis, port facilities, and the containers themselves.

Yet containerization's full potential has hardly been tapped.

Container cargoes in U.S. foreign trade in 1971 amounted to only about one-fifth of the total liner tonnage transported. Although this represents a better than five-fold increase over 1968, when containerized shipments aggregated only four percent of our foreign liner trade, it is clear that some 80 percent of liner cargoes are not taking advantage of this high-technology form of shipping, even though most of them probably are susceptible to containerization.

This fact led the Maritime Administration to carefully survey the present state of containerization in U.S. trade, with particular emphasis on areas where the system's potential was not being fully realized.

Out of this effort has come the present series of seminars, of which this one is a part.

By bringing together shipper and carrier representatives, along with equipment manufacturers, and government agencies, we hope to accomplish several goals, including:

- * A better understanding on the part of carriers and equipment fabricators of the needs of specialized container users.
- * A fuller appreciation by users of specialized containers and their present capabilities, as well as the directions in which future technology is moving.
- * And a better conception of the role that government regulation and promotion can play in enhancing specialized container movements.

We hope that this conference will establish a common base of knowledge among all the important parties to the movement of tank containers, thus leading to improved service for America's shippers and improved utilization for America's containerships.

Tank containers offer special promise in this regard. They permit the more economical shipment of certain commodities — such as liquor and fruit juice concentrates — once thought to be uncontainerizable. They permit shippers to eliminate unnecessary packaging, such as in crates or bottles, and reduce losses from damage or pilferage. Additionally, American manufacturers can build tank containers of almost any size and description.

Despite these natural advantages, the use of tank containers is the exception rather than the rule today. One indication of this is the fact that specialized tank containers represent less than one percent of the U.S. container inventory.

By increasing the usage of tank containers in U.S. foreign trade, I believe that all of us can make a direct contribution to the health of our liquid-cargo shippers, American steamship lines, and the U.S. economy.

For shippers, an increase in the availability of tank containers and their adaptation to the shipper's specific needs means the ability to increase their presence in existing markets and to penetrate new ones.

For steamship lines, these new cargoes mean the profits necessary to support their present investment in containerization and to enhance their ability to adapt new technology as it evolves in the future.

Finally for the American economy, an increase in exports and a stronger merchant marine mean a more advantageous trade balance, more jobs for American citizens, and a more rapid rate of economic growth.

I am confident that your full and frank discussion in this seminar today will put us all on the right track to achieve these worthy goals.

PRESENT CONDITIONS
CARRIER EXPERIENCE

Robert B. Murphy
Vice President, United States Lines

I appreciate the opportunity to participate in this conference and to share with you my views, and those of my colleagues in the industry with respect to our role in the utilization of this specialized type of equipment. The speakers, who will follow me, will cover other aspects of this equipment. I shall endeavor to touch upon some of the developments, benefits and problems which the carriers have been exposed to in marketing and operating with tank containers.

Of all of the types of equipment that we deal with in containerized systems today, the tank container is probably the most unique. It has limited application as a cargo carrying unit. It is subject to a broader range of regulatory authority than standard dry containers. It requires specialized peripheral equipment to keep it in operating condition.

There is a variety of types of tank containers utilized in international commerce, many of which are designed and constructed for a specific application.

The units which are the subject of today's discussion are those designed and constructed to meet the standardization criteria which has been developed by the international standards organization and the American National Standards Institute. They may be generally described as those with standard dimensions of 8' x 8' x 20' or 8' x 4' x 35' or 40'. Within the confines of these dimensions, there are various tank configurations, the most common being elliptical or cylindrical, including the so-called twin barrel arrangement which would be a low profile unit with two cylindrical tanks, approximately four feet in diameter, arranged side by side within the overall 8 foot width and 35' or 40' length.

The liquid capacities of the configurations indicated above range between 4,000 to 7,000 gallons. Actual carrying capacity for any given commodity, of course, is limited to the various density and physical properties related to that commodity.

The units are constructed for multi-modal usage in a transportation system where the transfer between ships, rail car and truck is readily accomplished through standard hardware fittings and handling techniques, the end result of which is a point to point or door to door movement without the need to transfer the commodity to intermediary tanks during the move.

The population of intermodal tank containers is small in comparison to standard dry units. The most recent tally I have seen indicates that U.S. flag ocean carriers have approximately 900 units. Other flag carriers have approximately 500. This total of 1400 units is less than one percent of the total container population. Ocean carriers' units are primarily utilized in the carriage of chemicals and alcoholic products. We are making an assumption here that the tank container provides the most viable and economic unit load for the carriage of these bulk liquid products rather than the breakbulk method using drums, barrels or carboys.

Having set the scene in which we are viewing the tank container and its operating environment, I shall endeavor to relate some of the U.S. flag carrier experience that I am familiar with in dealing with this equipment. I, of course, am drawing more from the experience of my own company; however, I think it typifies the experience of other carriers.

The acquisition of the hardware and concomitant capital investment is the first traumatic experience since the cost of a basic tank container without insulation, heating coils, special piping and valves can run about \$10,000 a copy for a volume quantity purchase. With added special features, the price would escalate to \$13,000 or \$14,000. Most of the ocean carriers have fitted out their tanks with some, and in a few cases all, of the special features mentioned. We are therefore talking of an industry investment of approximately \$14,000,000.

The commitment to invest in this high cost equipment must obviously be reinforced by good, reliable marketing data. It must also be qualified, however, by a well disciplined operating policy which recognizes the special talents required to service the equipment. This includes, but is not limited to, equipment control personnel to ensure optimum utilization in coordination with Sales and proper interline arrangements with other carriers; M&R personnel experienced in cleaning, inspection

and repairing tank containers; personnel experienced and familiar with the various regulations, both domestic and international, that govern the carriage of commodities in tank containers, as well as their stowage on oceangoing vessels.

The disciplined operating policy is a must in the handling of any type of equipment, however, with special equipment, such as tank containers, there is far less flexibility.

There are many "go" and "no go" situations that we, the ocean carriers, have gotten involved in with tank containers which severely test the relationships of Sales and Operations. One way utilization and dedication to one commodity are two situations which can draw the battle lines very quickly. Both of these situations erode the optimum use of the equipment. We have found through experience, however, that certain trades preclude round trip utilization. Despite the modern techniques of cleaning and passivation, there is no way to market latex on the rocks or scotch flavored mattresses.

Where there is incompatibility, it is necessary to segregate and control the tanks to preclude such exotic mixtures. For the carrier, this means increased cost for additional tanks to service the trades, as well as special control systems to keep the units in the trades that they belong. It also means added deadheading or positioning costs. This, of course, is bad news for us and it is in such cases that Operations will implore Sales to don their matchmaker's costume to seek a willing candidate for a marriage we so vitally need.

Fortunately, all trades are not one way. Chemicals, for example, tend to be more compatible so that round trip utilization is possible after the required cleaning is accomplished following each individual move. Obviously, geography is a vital factor in matching up round trip moves since we are dealing with point to point traffic and not port to port. By way of illustration, Rotterdam may be the port of discharge and loading of tank units. The port is balanced, but the inbound tank goes through Rotterdam to a point in Germany for discharge, then to an intermediate point for cleaning before spotting for loading in Belgium for export through Rotterdam. The same situation obtains in the United States. We therefore strive for balance beyond the port, which area can become the "never never land" if the equipment gets out of control.

When I speak of control, I refer to it as an all encompassing activity which includes the very necessary requirement of condition of the tank upon presentation to the shipper for loading. In the trades that we are involved in, the consignee is required to clean the tank upon discharge prior to return to the carrier. Some carriers elect to receive the tank in a so-called dirty condition with the understanding that they will control and do the cleaning, billing the consignee for the service. Other carriers elect to have the consignee perform the cleaning and return the tank in a clean condition. In either situation, a hassle ensues unless all parties involved agree beforehand as to the extent of the required cleaning. It is not just the interior of the tank that is in question; it is the lines, valve seals and gaskets that may also be involved.

The entire cleaning process has a direct bearing on the carriers ability to respot a tank for loading after receipt from a prior consignee. In many cases, the tank must be cleaned again or gaskets must be changed, all of which is a factor the carrier must ultimately chalk up as a cost of being in the tank business.

Another aspect of control which we must cope with is the handling of our equipment by other carriers. The tank containers are subjected to various strength and safety tests to meet operational environment requirements and prescribed safety standards. The criteria of these tests are rigorous. Recognizing this, we still pray a little when we think of some of the humping activity executed by the railroads and straddle carrier gyrations on terminals employing such systems.

We can take little comfort in the fact that the tank initially met the necessary regulatory criteria upon its delivery to us from the manufacturer. Coast Guard and DOT regulations require recertification at specific intervals or after the tank has undergone a major modification or repair. This means, of course, very close coordination between Equipment Control personnel and M & R personnel to ensure that the tanks are usable and ready in every respect before dispatch to a customer.

The type of liquid to be carried in the tank obviously has a direct bearing on this situation. The carrier has the responsibility to properly evaluate the product before acceptance to ensure that his specific tank and its related fittings can meet the requirements. My own company's experience in dealing with this facet of the operation may not necessarily reflect that of the other ocean carriers but I am certain that similar procedures prevail in the industry to that which I will describe.

Having established a market for a tank container, the ultimate aim was to have a unit designed and constructed to meet the broadest product range or requirements in the trade in which the tank is to be used. We initially established a Commodity Review Committee comprised of members of the Container, Marine, Claims and Marketing Department representatives to ensure that consideration would be given to all aspects of the available commodities that could be carried in the designated trade. The work of this Committee more or less established the design requirement of the unit ultimately purchased. It also established the guidelines for the procedures to be followed which would not only meet initial requirements, but which would permit further evaluation of additional commodities as they were offered to ensure that we could expand the utilization of the tank containers without the proliferation of additional types or designs.

The unit that we opted for is the lightweight, low profile twin barrel type which I had mentioned previously. Ours is the 40' length which is compatible with the standard system we use. It has an internal design capacity of 6,020 gallons and a maximum load capacity of 51,600 pounds. The barrels are interconnected which preclude the ability to carry two different types of commodities in each individual barrel at the same time. We have not found this latter situation to be a requirement in the trades that we serve. The tank is not insulated. It is of stainless steel construction smooth bore, which gives us the advantage of a minimum tare weight and permits us to maximize with the highest obtainable payload.

The tanks are now employed in our European service. A portion are dedicated to the so-called whiskey trade and the remainder are utilized for chemical products.

As we gained experience with these tanks, we have endeavored to meet the needs of shippers by providing special fittings and valves to suit their requirements. We have not entered the insulated tank trade as yet; however, as you are probably aware, some of our friendly competitors do provide such equipment.

This really gets us to the heart of the matter, that is the limits of elasticity that the ocean carrier has or, more importantly, must understand in the provision of special equipment. Expanding markets and new products in the bulk liquid industry create a demand for a highly specialized transportation system. This has the obvious appeal to those of us providing a transportation service and endeavoring to maximize revenues in the generation of new business.

When I speak of specialized equipment, specifically for bulk liquid commodities, there must be a well balanced evaluation by the ocean carrier of his capabilities in offering a new service. Failure to make such a pertinent evaluation could conceivably result in adverse operational consequences and attendant increased costs after the carrier has committed himself to the service. In making such an evaluation the ocean carrier has to recognize that he must explore the viable alternatives to capital cost commitment for additional specialized equipment.

There are some situations wherein it is more beneficial in the long run for both the shipper and the carrier to have the shipper supply the required tank container wherein the unit would be designed and constructed to the shipper's specific needs. In this case, the ocean carrier can contribute technical, operating and marketing experience in assisting the shipper with his specific program. The ocean carrier can provide the major ingredients of the ocean transportation and, where required, chassis equipment to facilitate the land move. In an arrangement such as this, there is also the possibility that if the shipper is involved in one way traffic, the ocean carrier can be of assistance in seeking utilization of the tank containers for return loads. This obviously requires a great deal of coordination and cooperation between shipper and carrier, but it is a viable type operation. I speak from experience here since my company is involved in this kind of traffic to a limited degree.

There are other alternate sources of supply of intermodal tank equipment other than carrier or shipper supplied, but are, to the best of my knowledge, very meager. The container leasing companies, taken as a whole, have a substantial amount of standard dry containers available under a variety of leasing arrangements. Their inventory of intermodal tank containers amounts to a handful. It is understandable that they would not invest in tank containers because the usage rate and special caretaking requirements compare unfavorably with the standard dry unit.

Recognizing the many qualifications I have stated with respect to the intermodal tank container and its usage, I may have conveyed to you that the ocean carrier views his role as a passive one in participating in this business. I would like to underscore that, in my view, and I think I speak for all the American flag carriers on this point, we cannot be passive in any phase of our business. We are seeking to expand our markets and, in this regard, establish better communication with the shipping public as to what we can contribute in know how and service.

A conference such as this is a giant step in improving the communications. It permits a dialogue that complements the sales and promotional efforts of the carriers in selling their service. It is particularly important in the area of specialized equipment where all concerned can get a better insight on the problems involved and, at least, get the wheels in motion to seek solutions.

In comparison to the overall developments of containerization and intermodal movement of cargo in international trades, the movement of bulk liquid commodities in intermodal tanks is the least spectacular. We all agree it is a unique field and, on a comparative statistical basis with dry cargo, may now show dynamic growth. This is not to say it should therefore be ignored. In my view, there is still a great deal to be done in this field.

On behalf of my colleagues in the maritime industry, I am sure we can go on record that tank containers have been an excellent source of freight revenues for us and that this "ancillary service" for transport of chemical and liquor products has enhanced our position in providing service to our shippers. We would like to think that the acceptance of tank containers by more and more shippers is a testimonial for our effort to meet the challenge of containerization in modern transportation. Thanks to the excellent cooperation by our people in Government, we have also become more knowledgeable.

Speaking on behalf of United States Lines as a carrier dedicated to provide the best possible service, we hope we can contribute to the further growth and development in this field.

PRESENT CONDITIONS
SPIRITS

Louis P. Fazio
Manager, Corporate Intermodal Containers
National Distillers Corp.

Hopefully some of the information I pass on to you today will be beneficial toward your study and progress of tank containers in the future. I'd like to preface this by saying that National Distillers was a leader in the field of transporting bulk spirits in tank containers commencing the program back in 1966-67. While the carriers were investing in tank container equipment we were investing our capital in installing four 50,000 gallon stainless steel storage tanks at our bottling plant in Cincinnati, Ohio.

I feel that I can be more effective if I talk about the specific commodities that our company handles in tank containers or tank trailers. Our imports are Scotch Whiskey from Scotland, Brandy from France, Rum from England and Cooking Wine from Spain. Our exports are Bourbon to Germany, Ethyl Alcohol to Puerto Rico and Curacao. In a quick analysis of the products involved here I can tell you from my experience that when handling them one step soon led to another step; therefore, I think it will be best if I break it down to something like this.

1. The product
2. Cleaning
3. Rates and utilization of carriers equipment
4. Our recommendation for faulty equipment

Now that I have these categories I can elaborate on them in more detail. For the most part I shall confine my remarks to spirits, however if time allows I'll back track somewhat and touch lightly on our other commodities. As a matter of information, Scotch comes in at about 130 proof, Brandy at about 136 proof, Rum at 160 proof. Bourbon is shipped at about 87-88 proof and commercial alcohols generally at 190 proof. Because of this fact the flashpoint of these products are classified as red label items and the tank containers are placarded as "flammable" and are required to be transported on the ship above deck.

There has been some confusion as to what method should be employed for determining flashpoints, which is the degrees in fahrenheit of combustibility. The values are by Tag Closed Cup method or open cup. In order to avoid any confusion or delay of the movement of our tank containers at port terminals we have requested that the flashpoints using both methods be shown on the necessary documents so there would be no question when moving on land or water.

Because our people are constantly aware that our product is eventually going to be put on the shelf selling to the consumer under an advertised brand name and in no way do we want to jeopardize that name, we have then to this degree become somewhat fussy, picayune and cautious so we can in the end feel that we are marketing a quality product which we can be proud of.

When we went into this program we made sure that the 5000 gallon capacity tank containers being offered were stainless steel and were passivated, which means that they were treated chemically so the contents would not react readily with the metal of the tank and have an adverse effect upon the product. We also made arrangements for samples to be taken just prior to loading and labeled with the tank container number, dated and shipped by air to our receiving plant. Samples of course are taken again before unloading and matched up. Although this appears to be a natural procedure to follow, you'd probably be surprised to find that there are many who do not take samples. In conjunction with this we also check for proper seals and seal numbers.

Since we always worry about contamination, clean equipment is a must. Thus the following questions arise:

1. Do we use tanks which are dedicated solely to the whiskey trade?
2. Do we use tanks which are used to carry only compatible products?
3. Or do we use tanks which have carried products that are not compatible - usually those which have a petroleum or oil base.

In the beginning the carriers used tanks which were dedicated solely to the whiskey trade or carried only compatible products.

To date this still holds true with the exception of Sea-Land Service, I believe. They have installed a cleaning system in Grangemouth, Scotland, which they feel is capable of cleaning the tanks properly regardless of almost any product previously loaded.

Nonetheless, all the carriers are required to issue a certificate stating that they guarantee the cleanliness of their tank containers. Inspections, however, should be made before accepting equipment. We learned of two methods of cleaning that were being employed - one called the Spinner System and one called the Detrex or Tri-O-Gen System. Briefly, the Spinner System consists of putting hot alkaline (a soap solution) about 180 degrees fahrenheit and pumping it through a spinner at so many pounds pressure per square inch. The spinner is inserted in the dome cover and rotated in such a manner as to hit all the interior portions of the tank. The solution is recirculated continually until the tank is deemed properly cleaned - it works similar to a dishwasher.

The Detrex or Tri-O-Gen system cleans the internal surfaces of the tank by using a non-flammable chlorinated hydrocarbon solvent which dissolve the basic solids and allows them to be washed away. The difference between this system of cleaning and the Spinner system is that soluble contaminants are placed in solution with solvents as opposed to dispersion by an aqueous solution. This system of using non-flammable solvents furnished a continuous supply of clean solvent vapors to the interior of the tank or anywhere air can go. These vapors condense back to liquid form when they contact a cool radiating surface, much the same as steam condenses within a radiator. The Detrex system is a superior method of cleaning than the Spinner System.

Now we get into the subject of RATES and I shall try not to belabor this topic but rather relate briefly a few of the goals I've strived toward. The ratio of our inbound scotch to our outbound bourbon in tank containers is about 7 to 1 in favor of the inbound scotch, however, bourbon has been slowly and steadily increasing. This prompted me to seek incentives for stimulating shippers and receivers to utilize carriers equipment for round trip moves and also prompted

me to seek rate adjustments concurrently. My proposal to the rail carriers to turn around tank containers within a certain time limit and reduce round trip piggyback rates from and to the ports of Norfolk/Portsmouth and New Orleans met with success, however, my proposal to the ocean carriers for special reduced round trip rates was not entertained.

We know that there is not going to be one outbound tank of bourbon for every inbound tank of scotch, nonetheless, when there is an outbound shipment of bourbon available it should be timed so as to utilize a carriers tank container that is on its way in. This sort of timing and scheduling cannot always work within a single company, but I do believe that there are a number of importers and exporters of spirits in the Kentucky area and other companies with possible other compatible products with whom can be formed a central communication network whereby one can locate and have access to inbound trailers making it possible for round trip moves. This would also provide a means for different companies who only have one-way moves to join with other companies in order to mutually benefit economically from employing the round trip move. It further reduces the risk factors insofar as contamination is concerned and normally just a rinse or flush out with water of the tank is all that is necessary. It will also alleviate a carrier from having to deadhead equipment from a port for placing empty containers.

I'd like to inject here that when we do have the opportunity to turn around a tank container and it is unloaded at our Louisville, Kentucky plant and then sent to Frankfort, Kentucky for reloading we put our seal on the hatch as added protection when moving the empty container.

Unless I stand corrected I believe that the ocean rate on bourbon in tank containers is lower today from the Gulf Ports than from the North Atlantic Ports to the Continent. This makes it difficult to turn around carriers equipment through the same port, particularly when there is a lower ocean rate from United Kingdom Ports to North Atlantic Ports than to Gulf Ports. I realize that there are more than one Steamship Conference involved here, but we should be able to overcome some of these barriers.

I would like to digress here for a moment to make a single comment about the pending cancellation of the interchange agreement between Southern rail lines and the ocean carriers scheduled to become effective on or about May 1. We have asked the rail lines for a postponement of the effective date so that we could have more time to find out if a solution could be reached without cancelling interchange agreements between the carriers.

In conclusion I would like to say something about our Recommendations for Faulty Equipment. We don't look for faulty containers, but from time to time one may well be faced with just such a piece of equipment under load that must be transferred to another tank container. We have had a couple of these now so for this reason I have sent to the various carriers involved a set of procedures which we recommend to follow for transferring bulk spirits from one tank to another tank should it become necessary; it is hoped that these procedures can be adopted as guide lines for our industry and perhaps may be incorporated into the safety requirements for marine terminal operations as well. For your convenience I have made available copies of our procedures.

Thank you for your kind attention.

PRESENT CONDITIONS

CHEMICALS

Lawrence F. Leonard

Manager, International Distribution Planning
Union Carbide Corp.

I am very pleased to be here to discuss a topic of very real importance to Union Carbide Corporation. Both liquid and dry bulk containers have been a significant mode of transportation for us for a number of years. We were one of the pioneers in the ocean movement of dry bulk in van boxes back in 1961. We have also been very active moving liquid chemicals in portable containers for the last eight years.

It may be worthwhile to place our resin and package chemicals business in some perspective. Our 1972 total export sales income was about \$260,000,000 of which about 50% was chemicals and plastics. This sales income included the shipment of approximately 100 million pounds of dry resin world-wide. It also includes the movement of about 80 million pounds of chemicals in drums and portable tanks through the world. As you can see, export business plays a significant factor in Union Carbide's total business activity.

Of our total export dry resins movements, only about 1% was actually made in bulk. You might wonder, then, why I am here speaking about this subject. Although we haven't employed this mode very extensively, we do recognize the potential opportunities it presents and have conducted a number of in-depth studies into the feasibility of its use. I think a discussion of the reasons this volume is so limited is quite pertinent and I hope will provide others with an insight into the problems of shipping resins or other dry cargo in bulk. Later I intend to discuss liquid chemicals in portable tanks. We are considerably more involved in shipping liquid tanks than in moving dry bulk.

First, as I mentioned, Union Carbide recognized the cost advantages of shipping dry bulk in ocean van boxes when we initiated this mode of transportation for our own inter-location needs 12 years ago. Since then we have been operating two container vessels from Texas City, Texas to Perth Amboy, New Jersey. We recently initiated a

separate service from our facilities in Ponce, Puerto Rico, to Perth Amboy. We now have in service several thousand 8 x 8 x 30 foot van boxes for transporting polyethylene and polyvinyl chloride resin. We also have several hundred portable containers for Bisphenol A. I believe Mr. Rea, Vice President of The Heil Company, is going to discuss the containers we are using for Bisphenol A, so I will leave that subject to him.

Our 30 foot van box system operates very much like any other ocean carrier's as far as the physical handling of the box itself on and off the ship is concerned. However, because of the uses intended, these containers are constructed only for the transport of dry bulk. They have a top loading hatch and rear discharge vents. With a few exceptions, there are no doors in the containers, which obviously precludes the possibility of loading and discharging general cargo. We restrict the use of this container to inter-location movements only. We do not ship this container to customers. Our Perth Amboy facilities are used to transfer the resin from our ocean van boxes into hopper trucks, hopper cars, gaylord boxes, and bags, which then serve as the means for delivering material to the customer. Needless to say, the use of the ocean van box for our inter-location movements constitutes a very important link in our overall domestic distribution program.

However, since I am in the International Distribution Department of Union Carbide, I would prefer to focus my remarks on our export activities. I previously stated that we are not presently exporting any large volumes of dry resin in bulk via ocean van box. I keep mentioning resin since we have few other dry products moving in sufficient quantities to be likely candidates for bulk movement. As you probably know, most resins have relatively low selling prices—somewhere in the 10 - 20 cents per pound range. As a consequence, we are extremely interested in any technique that offers a means of reducing our distribution costs. Because of the cost savings possible through bulk shipments, we have performed numerous analyses on the development of this mode on a world-wide scale. As a result, we have made the following observation.

To offer any real economic advantage, the bulk van box must be delivered to the consumer. This might be either a customer or an overseas plant in the case of a raw material. We have found little, if any, advantage in transferring the packaging activity itself overseas.

I would like to illustrate my remarks with a hypothetical example. Let us construct the costs of shipping resin from a location near New York to the port of Antwerp in bags and in bulk.

Table 1

Please note that there is a savings of \$9.70/LT if you can deliver the container to the consumer without rehandling the material. There are certain assumptions in the example that should be mentioned.

1. There are no storage costs shown. The assumption is that the material is held in bulk storage until time to load the product either in bags or bulk for export shipment. This may be somewhat inaccurate in real life where there is often a tendency when shipping in bags to perform the bagging operation when convenient and to store the product in a warehouse awaiting an order.

2. The ocean freight rates for bulk and bag resin shipments are the same in the example. Whether this would actually be true is largely unproven since there is only one ocean tariff containing bulk resin rates at the present time. In general resin rates are established on a weight basis. Therefore, the rates on bags and bulk would likely be similar unless the quantity that can be loaded in a container changes significantly from bag to bulk.

Now let us suppose that the consignee cannot accept bulk. We may then want to evaluate the costs of bagging the material overseas for local delivery.

Table 2

Note the cost elements that are additive to the bulk liner case. In this example the following assumptions were made.

1. The cost of bags (paper or polyethylene) is the same overseas as in the U.S.

2. The cost of bagging and loading using foreign labor is only one-third as expensive as using U.S. labor.

3. It will probably be necessary to construct storage and bagging facilities overseas. The cost indicated assumes a movement of about 5000 tons of 5 different products through a facility costing \$50,000 and having a 10 year amortization period. There is also a facilities cost when the product is bagged in the U.S. I am considering this to be an incremental cost additive to the indicated bagging cost.

Based on these factors, our distribution savings have been eliminated. In the first example of bulk vs bag delivery, we achieved a 12.5% reduction in the costs. In this last situation the reduction is nil.

I have not included the costs of unloading or a comparison of in-plant handling between the two modes. These may be significant factors but are difficult to quantify when shipping to a customer. Such cost savings may provide the customer sufficient incentive to convert to bulk.

Obviously every company and every industry has somewhat different economics. However, these figures are fairly typical of the results we have determined from several such calculations.

An additional factor to consider is that your customer generally looks for a price reduction if you ship in bulk rather than bags. If a price concession allows you to hold a market against competition, it may well be worth sharing the savings. Otherwise, you have to ponder the more subjective advantages and disadvantages of bulk vs bag to decide what is in your best interests.

A general observation is that many overseas companies don't operate on the scale of American companies and the purchase of such large quantities is often not feasible. One of the most likely possibilities for developing dry bulk shipments is the movement of raw materials to your own manufacturing facilities where costs and service can be evaluated and controlled.

Let us now turn our attention to the shipment of liquid chemicals in bulk portable tanks. Union Carbide has developed a substantial overseas market for chemicals delivered via this mode. In 1972 we shipped about

400 portable liquid tanks overseas. The areas to which we are now shipping portable tanks are:

Continental Europe
Scandinavia
Latin and South America
Caribbean

We feel bulk portable tanks offer us an intermediate size delivery increment between the drum and deep tank or parcel tanker. We recognize many customers will never grow beyond the multiple drum stage. However, we feel it is important to offer a means by which the customer can achieve savings by purchasing in bulk and can also conveniently expand his purchases to the point where he can ultimately accept tanker parcels.

A large percentage of our shipments are made using the ocean carriers' portable tanks. However, we encountered a particular situation in Central and South America that required a unique response on our part. As you know, all the carrier tanks have a capacity of about 5000 gallons. We found many customers who simply did not want to buy in such large increments. They had several reasons; such as, available cash, import restrictions, storage space. Union Carbide then developed a 2500 gallon portable container to serve this market. We now have 30 of these small tanks in service with 10 more on order.

We are quite satisfied that bulk portable tanks have helped keep us competitive in certain areas and with certain product lines that would not otherwise have been possible had we continued shipping in 55 gallon drums. I want to emphasize that, again, in every instance, these tanks move to the ultimate consumer. We do not ship portable tanks overseas to drum the material for local distribution. Essentially the same economics for transferring a packaging operation overseas applies to liquid bulk as well as to dry bulk.

I had considered developing a hypothetical example illustrating the cost advantages of shipping in bulk portable tanks as opposed to 55 gallon drums. However, unlike the dry bulk situation, the stability of the various cost elements in drums and liquid portable tanks are so subject to uncontrollable influences as to render such generalized calculations meaningless. For example, the density of the product has a very significant bearing on the transportation costs per pound of product since ocean freight rates for chemicals are generally established on a volume basis. The density is also important when calculating the

unit costs of the product from the price of the drums. In addition, an examination of numerous tariffs shows that the relationship between the ocean freight costs for drums and bulk tanks for any given group of products varies widely.

These factors, which are quite significant, prevent generalized distribution cost calculations. Each combination of product, origin and destination requires a separate calculation using factors applicable to that situation. Even so, we have observed that, in nearly every such calculation, there is a distribution cost advantage when shipping in bulk rather than drums.

As with dry bulk, the customer must conclude that liquid bulk offers him advantages also. Since the customer loses the possibility of using or reselling the used drum, he frequently expects to be compensated for his loss by a reduction in price. Hopefully he will determine there are manpower savings to be achieved in his own operations through the storage and handling of material in bulk rather in multiple smaller packages. In those countries where duty is exacted on the delivered cost, then any reduction in distribution expense pays off twofold. Therefore, the combination of reduced customs duties, where applicable, operational savings, and a share of the distribution savings should persuade the customer to purchase in bulk rather than drums.

We are concerned that the extension of the use of portable tanks into areas other than those mentioned has been inhibited because of a lack of availability. For example, during a recent trip to the Far East, I found a great interest in portable tanks. Unfortunately, every carrier I talked with about developing service to these destinations replied that it is uneconomical because there are no requirements for the tanks on the return leg of the trip. We hope that some return cargo can be developed or some equitable arrangement concluded which will induce carriers to offer this service to areas where it is not now available. We feel certain that if this were done, the following results would occur.

1. There would be an increase in the total sale of those products previously moving in drums and subsequently switched to portable tanks.

2. An increased sale of related products in drums. There is inevitably a greater demand for other chemicals as a shipper's market share expands.

We have particularly appreciated the actions of the U.S. Coast Guard in simplifying and accelerating the approval of new products for shipment in portable tanks. This has been of very real assistance to the shipper.

However, we would like to appeal for better coordination between the different modal administrations within DOT. It is my understanding that there have been certain problems in this area. An example is the current delay in issuance of needed specifications for low pressure tanks.

We would also like to encourage common files within and between agencies on approved products. This would reduce the effort of the shipper and the agencies by eliminating the necessity to resubmit applications and data on products which have already been reviewed by an appropriate authority.

In summary, Union Carbide actively supports and promotes the use of bulk transportation of both dry solids and liquid products. As is true with any business, we are careful in selecting the opportunities of employing these modes so that we maximize the benefit to ourselves, the carriers and our customers. I hope my comments have helped to illustrate how we look at our costs and other related factors to be able to recognize such opportunities.

Table 1

Hypothetical Example

COST OF SHIPPING RESIN - NEW YORK TO ANTWERP

<u>Via Bags</u>		<u>Via Bulk Liner</u>
\$/LT		\$/LT
\$ 6.70	Bag Cost	\$
3.50	Bagging	
3.00	Pallet	
3.10	Loading	.70
18.60	Inland Freight	18.60
36.00	Ocean Freight	36.00
	Liner	5.90
\$70.90	TOTAL	\$61.20

Table 2

Hypothetical Example

COST OF SHIPPING RESIN - NEW YORK TO ANTWERP

<u>Via Bags</u>		<u>Via Bulk Liner</u>
\$/LT		\$/LT
\$ 6.70	Bag Cost	\$ 6.70
3.50	Bagging	1.00
3.00	Pallet	
3.10	Loading	1.70
18.60	Inland Freight	18.60
36.00	Ocean Freight	36.00
	Liner	5.90
	Facilities Amortization	1.00
\$70.90	TOTAL	\$70.90

(Includes Overseas)

(Bag and Bagging.)

PRESENT CONDITIONS

FOCD

Charles A. Wilhelm

Manager of Transportation, Intermodal Division

A. E. Staley Mfg. Co.

We are pleased that the Maritime Administration has invited the Staley Company to participate in this Conference on Tank Containers today and to share our experiences with you. For those of you who may not know, the Staley Company is a major processor of corn, soybeans, and chemicals with Corporate offices and major manufacturing facilities located at Decatur, Illinois.

Staley exports large volumes of liquid and dry products to over 100 ports throughout the world each year. These products are shipped in tank trailers, ships tanks, barges, drums, bags and cases. The Company's largest movement of liquids in tank containers is to Puerto Rico. Other movements are to Europe and Hawaii.

Staley has been a shipper of both large and small lots of bulk liquids for over twenty years. Before we discuss in detail our shipments in tank trailers, it might be well to review our history in bulk shipping. Several years ago substantial quantities of bulk soybean oil and corn syrup were shipped to Cuba and Puerto Rico in through railroad tank cars via Seatrain Lines and West India Fruit & Steamship Company. With the take over by Castro in Cuba and the subsequent withdrawal of this type of service to Puerto Rico by Seatrain, this type of bulk shipping ended.

Another method of shipping which we have used for many years and are still using today is "deck" tanks. Deck tanks are usually railroad tank car shells which have been mounted on deck or, in some cases, below deck. Today Transamerican Trailer Transport have two such tanks on their ship "PONCE DE LEON" which we use to ship both corn and soybean oil to Puerto Rico. These tanks are owned by our Puerto Rican customer. We have just completed a joint project with TTT to add one of our older 8,000 gallon tank car shells to TTT's ship, "ERIC K HOLZER" for the movement of corn and soybean oil to Puerto Rico. The tank is owned by Staley and is for our exclusive use.

Loading is accomplished with our privately owned tank truck which is driven on board where the product is pumped to the tank. In Puerto Rico, the oil is discharged by gravity into tank trucks. This method is especially well suited for buyers who insist on regular, uninterrupted shipments of oil and who are willing to go to the extra work involved to receive oil in this manner.

The method we use for shipping larger quantities of soybean oil to Puerto Rico is ocean barge. We presently ship up to 1,800 tons of soybean oil per given voyage on the 5,000 ton barge CATANO to the Puerto Rican tuna packers. In this case, the oil is trucked to our storage tank at Havana, Illinois, located on the Illinois River, loaded to a river barge and moved down the Mississippi River to New Orleans where it is transferred to land storage tanks where it awaits arrival of the ocean barge. All of the tuna packers in Puerto Rico have storage tanks and facilities to receive oil in ocean barges. This movement is working smoothly, except for occasional coordination problems. The total transportation costs by barge are about 40% lower than shipments in tank containers.

Please bear in mind that all of the product to which we refer today originates at our Decatur plant. All product shipped in tank containers moves to the ports in rail tank cars. We do not load any tank containers at our plant.

Let us look, now, at the method we're all concerned about today - through movements in tank containers. We have four separate movements in tank containers at present, three in Sea-Land tanks and one in Matson tanks. They are:

1. Soybean Oil from Elizabeth to San Juan.
2. Soybean Lecithin from Baltimore to Rotterdam and Hamburg.
3. Corn Syrup from Charleston, South Carolina to San Juan.
4. Soybean Oil from Los Angeles to Hawaii.

It was in 1966 that we made our first shipment in a Sea-Land tank to Puerto Rico. The product was edible soybean oil and was shipped to the tuna packers. Using this method was simple since it eliminated shipside pumping operations in both New York and San Juan. At that time, we maintained a tank car storage facility in New Jersey, as we do now, from where we had been drawing oil for the "deck" tanks of

Transamerican Steamship Corporation. The terminal personnel were already acclimated to export business and procedures, therefore, no problems were experienced in using this method. Our customers in Puerto Rico had bulk storage facilities, so they were already set up to receive shipments in through tank containers.

Our second movement in tank containers was to Europe. The first movement was in a Sea-Land tank and was shipped in October of 1969. The product was soybean lecithin, a by-product from soybeans used in baking, candies, margarine, soaps, etc. Soybean lecithin had been shipped in drums for many years, however, with the advent of soybean plants in Europe, product produced in the U.S. and shipped in drums was no longer competitive. Something had to be done if we were to retain the business we had had for so many years. We were familiar with the potential savings by switching from drums to bulk, but the costs for shipping in tanks had to be sufficiently low for the buyers to justify the expense of building storage tanks. Some questions which had to be answered were:

1. How do we ship the bulk product to seaboard?
2. Is there a facility at one of the ports where the product can be transferred from tank cars to tank containers?
3. Is Sea-Land the only carrier having tank equipment which can be heated?
4. Will Sea-Land be able to clean lecithin residue from their tank trailers?
5. What are the rates for the various new services?
6. Who will inspect the tanks for cleanliness?

Looking at the movement to seaboard, it was obvious from a quick comparison of the rail and truck rates that the most economical way to ship was by tank cars. However, we had no tank cars in our fleet of over 1,300 tank cars that were entirely suitable and yet free for use in lecithin service for an indefinite period. Therefore, after evaluating the costs, we leased two new 10,000 gallon railroad tank cars built to the specifications required for soybean lecithin. Tank cars of this gallonage were selected since they would allow us to load two 5,000 gallon tank containers to full capacity.

A search of facilities at North Atlantic ports where transfer could be performed revealed that the Baltimore and Ohio Railroad TBS Terminals at either Baltimore or Elizabeth could do the job for us. Baltimore was found to have the advantage because of lower freight rates and faster turn around times on our tank cars. The facility selected had to have steam for heating, a storage track, pumping equipment and terminal personnel with good general knowledge of handling food grade bulk liquids. Soybean lecithin is quite viscous and requires heating in order to unload and since Sea-Land's tanks were the only ones equipped with heating equipment, all other carriers were ruled out. Sea-Land's sophisticated cleaning system in the U.K. was found to be fully capable of cleaning tanks to Sea-Land's satisfaction for return loads of scotch whiskey to the U.S. Rates were established where none existed and other costs had to be confirmed.

Our third movement in tank containers was set up over Charleston, South Carolina and was for the movement of two grades of corn syrup to Puerto Rico. Our first tank container of syrup was shipped over Charleston in August of 1970. Some of the same problems were encountered in setting up this movement as on the movement to Europe.

The port of Charleston was selected because the rail rate on syrup to South Atlantic ports is 21¢ per 100 pounds lower than to North Atlantic ports. Charleston was found to have everything we needed except a suitable pump. After numerous discussions with the South Carolina State Ports Authority, they decided to purchase a pump for this business. A problem developed in the heating and transfer of our 1502 Corn Syrup, the most viscous of the two syrups. The port personnel heated the product too rapidly and overheated causing the product to caramelize. Being cautious thereafter, they heated the product to only 120° and found they were spending 8-10 hours transferring one 40,000 pound load and in the process overloading the pump causing it to kick out. The port informed us of the problem and asked for our help. Working with our technical people it was determined that they should heat to 140°, although slowly, and use air pressure in transferring to assist the pump. The recommendations worked and transfers have been fast and smooth ever since.

Our fourth and final movement is soybean oil from Los Angeles to Honolulu in 5,000 gallon Matson tank containers. This movement is essentially the same as our movement via Sea-Land from Elizabeth to Puerto Rico, therefore, we will not deal with this one in detail.

The total volume of all four of the movements in tank containers is about 200 tanks annually.

Naturally, there are substantial savings in costs on each of our movements in tanks. Based on actual experience, total savings in all costs up to the foreign ports range from 90¢ to \$1.30 per 100 pounds. We are not familiar with the savings our customers realize beyond the ports of entry, however, there are likely to be substantial. It might be well to point out that insofar as Staley shipments are concerned, total transportation and transportation related costs are greater for bulk shipments than for drummed shipments. Savings result because of the elimination of the drums, not because of lower transportation costs.

There have been very few problems in connection with the physical aspects of shipping in tanks. There have been only two Sea-Land tanks rejected because of contamination and these rejections occurred when we chose not to have an independent surveyor inspect for cleanliness prior to loading. In these instances, our loading personnel inspected the tanks. One Matson tank of soybean oil to Hawaii was contaminated with ink, the previous contents, which somehow escaped the attention of the independent inspector. As previously mentioned, the Port of Charleston had a heating problem and in the process overheated two tank cars of corn syrup before the problem was corrected. Our truckers have rejected empty tanks tendered to them for cleaning when they have previously contained liquids difficult to clean or having objectionable odors. We have never had a claim for loss of contents or damage to a tank.

There is one serious problem which has been with us for the past three years and that is an inadequate supply of tank containers. During peak shipping periods, there simply have not been enough containers to meet the demand. When a customer gears up to receive his product in tank containers and purchases his product accordingly, he becomes very vulnerable to damages resulting from a short supply of tanks. The first knowledge we have of shortages is when our freight forwarder calls Sea-Land requesting the tanks covered by their booking. At this point, it is too late to make alternative shipping arrangements.

What happens when a carrier is unable to supply tank containers when our tank cars reach port? It causes a chain reaction, reaching all the way back to our production schedules. Some of the problems are:

- 1) Our tank cars are detained at seaboard when they are needed back in Decatur for future loads.
- 2) Tank car demurrage and lease costs mount up when cars are idle.
- 3) Production schedules have to be changed from bulk loading to drum loading.
- 4) Customers have to be supplied with drummed material from local warehouses, when available, if the delay in securing tanks is lengthy. If no product is available, they are forced to buy product from our competitors, when possible.
- 5) Occasionally, after slack periods, several tanks are made available at one time, in an effort to catch up. This often floods our customers, resulting in costly demurrage.

These problems have a serious affect on this business not to mention the frayed nerves and enormous amount of time spent working on solutions. We are fully aware of the difficult position in which the steamship lines find themselves when unable to supply tanks, however, their inability to furnish tanks from time to time threatens both shippers and carriers with the loss of business. Sea-Land's people have worked hard to supply our needs, but there are times when no amount of work can turn up empty tanks when there are none. If other steamship lines would order tanks which could be heated, shippers would have a greater choice of carriers, and this would undoubtedly relieve some of the shortage of this type of equipment.

In closing, let me say that even in view of the shortage of certain types of tanks, we are dedicated to shipping in tanks containers. I am pleased that the steamship lines have introduced tank equipment and that they are continuing to add tanks to their fleets. We are constantly looking for additional opportunities to ship in tank containers and we are confident that much potential still lies ahead for companies who are not afraid to make changes which are mutually beneficial to themselves and their customers.

QUESTION and ANSWER SESSION I

William F. Black

(Federal Railway Administration) - Mr. Fazio, you discussed the problem of having a carrier transfer your lading from one tank to another. I wonder what kind of assistance you give to a carrier while he is trying to perform this difficult function.

Louis P. Fazio

(National Distillers Corp.) - We started running into a few problems on this subject and it was decided that we would send the carriers our recommended procedures on how we would like the transfer to be handled. We asked the carriers to distribute it to their personnel at the different terminals. In this way if the problem came up, their personnel would have something in their files that they could refer to on handling products.

REGULATORY ASPECTS
HAZARDOUS MATERIAL REGULATION
William J. Burns

Chairman, Hazardous Materials Regulations Board
Department of Transportation

Before getting into the meat of the discussion I would like to thank Vince Grey and the Maritime Administration for affording me the opportunity to appear here today and discuss certain aspects of the Department of Transportation's Hazardous Materials Regulations.

As most of you know the Department recently adopted the United Nations labeling system. This type of effort to promote harmonization and unification of codes will go a long way toward the facilitation of trade. Future efforts of this nature will assure shippers and carriers of equal treatment in most parts of the world and will also provide an element of safety which we are all desirous of obtaining. The effort toward standardization of labels serves as a landmark which should also be strived for in most other areas of hazardous materials regulation. The main topic here today concerns tank containers and I understand that Captain Schwing from the U.S. Coast Guard will speak to this subject in some detail later on in the program. However, I am particularly interested in this aspect of standardization because we must take into consideration not only sea transport but the effects and affects regarding the other modes of transport. Tank containers must be truly intermodal. Otherwise, you will have difficulty getting them to and from the docks. At the present time proposals are being made with regard to intermodal tank container construction not only in the United States but in the RID Safety Committee which is an arm of the Central Office for International Rail Transport in Berne, Switzerland, through the ADR regulations which is highway transport in Europe, the Intergovernmental Maritime Consultative Organization, the United Nations Committee of Experts on Transport of Dangerous Goods, and other individual countries.

I would like to remind you that the United Nations Committee is merely waiting for the results of the IMCO proposals and the RID/ADR proposals which should be forthcoming prior to the August meeting of the United Nations Group of Rapporteurs on the Packing of Dangerous

Goods. During the December session of the United Nations Committee, statements were made to the effect that in the August meeting the United Nations group should move very quickly to consolidate all opinions and recommendations in order to draft recommendations for truly intermodal tank containers to be recognized throughout the world.

A good example of an individual country's efforts are the proposals coming from the Federal Republic of Germany. The Expert from the Federal Republic of Germany said that a set of provisions on tank containers would be applicable at the European level as of 1 January 1974. He further reminded all concerned that efforts should be made to iron out the differences between modal groups and thus expedite acceptance of traffic. Gentlemen, on this basis I feel that we can no longer procrastinate, we can no longer be parochial with regard to singular modal interests that will defeat the very thing we are trying to accomplish, and that is to provide a safe container which will be accepted not only in the United States but in other countries of the world. Many of you understand this problem. However, I do not believe that many of you know that countries have already halted our container traffic at their borders. Fortunately, we have been able to prevail on foreign government officials to alleviate individual situations. However, if and when new requirements are adopted by convention this will probably be no longer possible. I cannot emphasize too much the urgency with which we must proceed to establish acceptable international standards.

At this point I would like to deviate slightly and talk about containerization since all of you gentlemen are also involved in this subject. As you know, once a shipment starts there is very little checking done to determine whether or not the shipment is what it purports to be or whether the individual packagings in the containerized freight in fact meet the applicable safety requirements. This is especially true with regard to retrograde munitions. Some way must be devised whereby we can rely on certifications from overseas points that the containers are packed in accordance with what the certifying official says. We are working on this problem at the present time with representatives of the Department of Defense. It has been suggested that my Office recommend a deletion of the certification requirement that the container is packed or that the packagings within the container meet the provisions of the regulations. I do not know what the

ultimate decision will be within the Department, but in my judgment it would be a mistake to change the certification requirement. Frankly, I am of the opinion that the Department of Defense should furnish inspectors qualified in the area of explosives and dangerous chemicals to perform inspections of containers of munitions when arriving in this country. Hopefully, a satisfactory arrangement can be settled upon. I do not intend that the public be subjected to what I believe should be termed as an error of commission.

Another subject which has been under discussion for some time and has never reached fruition is that of inspection of shipments of all types of hazardous materials at interchange points between modes of transport and interchange points within a mode of transport. Today carriers are accepting shipments on blind faith. Certifications are being accepted on blind faith. I do not believe that we should continue to perpetrate this acknowledgement, and take no action. I would welcome any suggestions as to how this can be accomplished and still not require additional paperwork burden. I believe it can be done.

The Office of Hazardous Materials is responsible, among many other functions, for the drafting and coordination of regulatory requirements between and among the various operating administrations of the Department. With the outstanding cooperation of the operating administrations we are undertaking two mammoth projects. One is an effort to consolidate the regulations of all modes into one single volume of cohesive, easily understood, national standards. Also in conjunction with this effort we hope to complete a total recodification, or as some people say, a total restatement of the regulations governing all modes. This will simplify the regulations. We will be able to delete some 800 pages of the Department's overall Hazardous Materials Regulations, and hopefully, the average citizen will be able to understand the requirements without having a degree in engineering or chemistry.

When considering intermodal regulation of hazardous materials it is imperative that the basic labeling, classification and packaging requirements be the same for each mode. Where placarding is involved, every effort should be made to standardize such placarding. I am of the opinion that these goals can be accomplished. A shipper packaging and labeling department often has no knowledge concerning which mode

of transport will be used to transport that package. Traffic departments normally make this decision. Hazardous materials in a great many cases travel by two or more modes of transport. This is nearly always true when giving consideration to tank containers. In the drafting of intermodal tank container specifications and operating requirements we cannot base these requirements on merely what exists today. Of necessity we must base requirements for future transportation on technological advancement and the hopes we have for improved safety. To give consideration to domestic or international standards based on what is being done today is wrong. If what is being done today, relative to tank containers, appears to be satisfactory from past experience, provision should be made for a grandfather clause in order to continue the use of tank containers throughout a useful life. Under no conditions should we base future safety requirements only on what we are doing now.

In my opinion one of the most important endeavors any regulatory body has attempted in recent years is what we call a Hazard Information System. This system is currently being developed by the Regulations Division of my Office. This system, through a uniform method of placarding and supplemental data, will provide technical and other information and advice to law enforcement and firefighting personnel of communities and to carriers and shippers for meeting emergencies connected with the transport of hazardous materials. Hopefully this will benefit emergency personnel before the fact as well as after the fact in potential or actual accident situations. Our proposal has been discussed for consideration before many groups within the United States as well as before international regulatory bodies such as the United Nations Committee of Experts, the Intergovernmental Maritime Consultative Organization, and the international railway and highway groups in Europe. The Hazardous Information System will encompass all those regulated materials except those shipped as low hazard in limited or small quantities.

The principal advantages of the Hazard Information System are:

- (a) it could be addressed to single or significant additional hazards of all materials subject to the United Nations recommendations;
- (b) the system could be augmented by preparation of a booklet containing approximately 60 Hazard Information pages which contain information on procedures and precautions that should be observed by emergency personnel in making judgments on how to handle specific situations;

(c) the system as adopted internationally would permit easy communication to emergency personnel in their own language; (d) considering the complexity and scope of dangerous goods, the system is relatively simple, and without great difficulty could be incorporated into laws, regulations and recommendations; (e) Hazard Information numbers essential to the implementation of the system may be used in conjunction with the United Nations recommended labels, and placards if such are developed. Also the advantage of two digit HI numbers on shipping papers would be another means of verifying the nature of shipments and would not make any significant changes in documentation procedures necessary; (f) use of the system would provide a means to verify transmission of oral information to officials and experts who may be long distances from accidents.

The Hazard Information System is a completely separate subject, and consequently time does not permit me to go into the program indepth. However, I would encourage any of you who are interested to let us know and we will be happy to send you copies of the proposal as it has thus far been worked out.

At this point I would like to again take the opportunity to thank you for allowing me to discuss a few of the things which I consider to be most important when playing the regulatory role. I have presented what I believe to be an overview in the increasingly complex and dynamic world of hazardous materials.

Thank you very much for your kind attention.

REGULATORY ASPECTS
REGULATIONS FOR PORTABLE TANKS
Captain Robert G. Schwing, USCG
Chief, Cargo and Hazardous Material Div.
U.S. Coast Guard

Good afternoon gentlemen, my name is Captain Robert Schwing. I am Chief of the Coast Guard's Cargo and Hazardous Materials Division of the Office of Merchant Marine Safety and I am going to speak today on the subject matter you see projected before you, namely the bulk carriage of hazardous materials in portable tanks.

The advent of containerization has increased the demand for the shipment of hazardous materials in portable tanks. This method of shipping bulk liquids has had the attention of shippers, carriers, and manufacturers for several years as it can provide for the safe, efficient and economical transport of hazardous materials. Unfortunately this is only the case if consistent, not overly restrictive, regulations are promulgated for the entire transportation system. Herein lies the problem.

Ideally a large quantity of a hazardous material should be able to enter the transportation system at the manufacturer's plant in a container which is sufficiently designed to withstand the rigors of the system. The container must be capable of properly containing its lading and of meeting the requirements of each mode through which it progresses. Again ideally, the transfer of the commodity from one container to another, or the restriction of the commodity to an economically undesirable container, in order to comply with the varied requirements encountered when transporting through several modes, should not be needed. This, unfortunately, is not often the case.

As you can see there are numerous regulatory bodies which control the flow of hazardous materials in each mode. (See Figure 1 - item a) Within the United States the Federal Railroad Administration, the Federal Highway Administration and the Coast Guard have different

requirements for portable tanks containing hazardous materials. These differences are further compounded for export or import shipments in that the varying requirements of foreign regulations, such as the International Regulations Concerning the Carriage of Dangerous Goods by Rail (RID) and the International Agreement on the Transport of Dangerous Goods by Road (ADR) add another dimension to the complexities governing hazardous material carriage in portable tanks. This then was the situation eight years ago when the United States commenced addressing this problem on an international scale.

Our attack on this problem has been two-fold. (See Figure 1 - item a & b) One, the Department of Transportation has directed its efforts through the United Nations' Economic and Social Council in an attempt to develop consistent international regulations for the bulk carriage of hazardous materials in portable tanks. As in any undertaking in the international arena, progress has been slow, but there has been progress. Presently, the various countries sitting on the Economic and Social Council have before them a draft speaking to the design criteria for an intermodal portable tank. Further discussions on this tank will take place in August of this year.

The second approach has been to take this matter before the Intergovernmental Maritime Consultative Organization (IMCO) and the International Standards Organization (ISO). Here the success has been more pronounced. The United States Coast Guard represents the American Government at IMCO. In 1966 that organization began discussion on an American paper covering the minimum design requirements for a portable tank carried by sea. In 1970 IMCO adopted as a part of its Dangerous Goods Code specifications covering the design requirements for a portable tank with a design pressure of between 25 and 43 pounds per square inch gage. A very recent modification to this code, which was initiated by the United States, provided for a low pressure tank, 14.2 to 25 pounds per square inch gage, for the carriage of less dangerous chemicals. Although the final specifications for portable tanks which were evolved by IMCO were not entirely what the United States was seeking, the differences are such that they present no problem to the design approach used by American manufacturers. In fact, these specifications have become the building block upon which our emerging intermodal regulations are based and upon which we are now basing our thrust in the United Nations.

Economics dictate that a portable tank be designed for as low a working pressure as is safe, in other words as thin as possible, and also that it be designed for as large a payload as is possible. The Existing Department of Transportation specifications provide tanks which subscribe to two extremes in tank design, neither of which is economically suitable or desirable for the intermodal transport of bulk hazardous liquids. At one end of the spectrum the regulations provide for tanks with design pressures too low to adequately contain the majority of bulk hazardous materials transported intermodally. At the other end of the spectrum the regulations provide tanks which are greatly overdesigned for the majority of the commodities they are authorized to carry.

The need for portable tanks between these two extremes has been recognized by American industry and it has initiated an almost constant stream of requests for variances to the regulations, that is special permission to design, build and operate portable tanks which are either in the pressure range ignored by the Department's regulations or larger than what is allowed by the regulations. (See Figure 1 - item a, b, c) Utilizing as a guide the criteria which have been promulgated by IMCO the Department of Transportation has been issuing special permits authorizing the intermodal use within the United States of both American and foreign built tanks which meet IMCO's design criteria and the design criteria of the American Society of Mechanical Engineer's pressure vessel code.

Unfortunately this procedure is time consuming as each application must be handled individually. Obviously, what is needed, is a set of specifications in the regulations which adequately fill the existing void and which allow for an economic, safe portable tank.

Working in consonance with American industry and other government personnel through its Chemical Transportation Industry Advisory Committee the Coast Guard has developed specifications for the construction and utilization of intermodal portable tanks. (See Figure 1 - item a, b, c, d) These specifications dovetail with the recommendations contained in the International Maritime Dangerous Goods Code and will, when they are finalized in the regulations in the beginning of 1974, provide the American shipper with a comprehensive set of specifications for the bulk carriage of hazardous liquids which will be international in scope and truly intermodal within the United States.

With the promulgation of the regulations for the intermodal tank the American shipper will have available to him an economical tank which will be accepted intermodally within the United States and also in the international marine mode. The remaining problem will be the development of consistent requirements for the European land mode, or any other desirable market area.

The attack on this final obstacle will be at the United Nations. (See Figure 2) It will be the job here of the U.S. delegation to ensure a successful melding of the consistent IMCO and U.S. specifications with the ISO specifications and the regulations of the Economic Council of Europe. The accomplishment of this task will yield the truly international, intermodal portable tank. Gentlemen, the bulk carriage of hazardous materials in portable tanks will then have come of age.

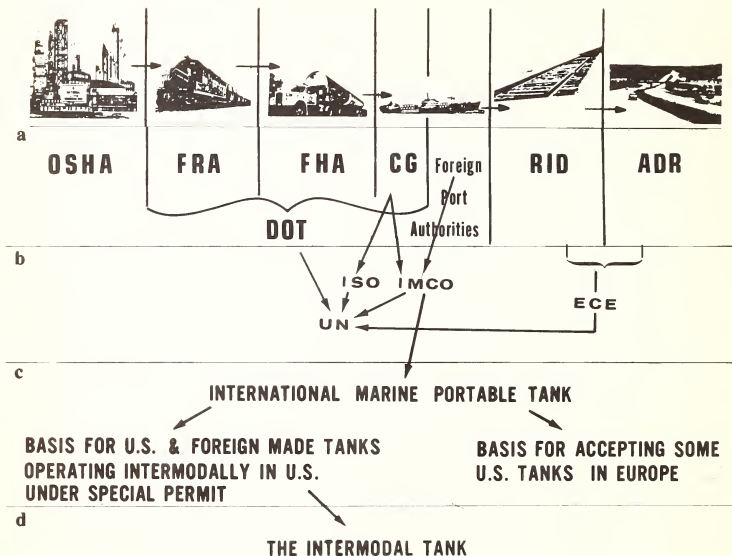


Figure 1

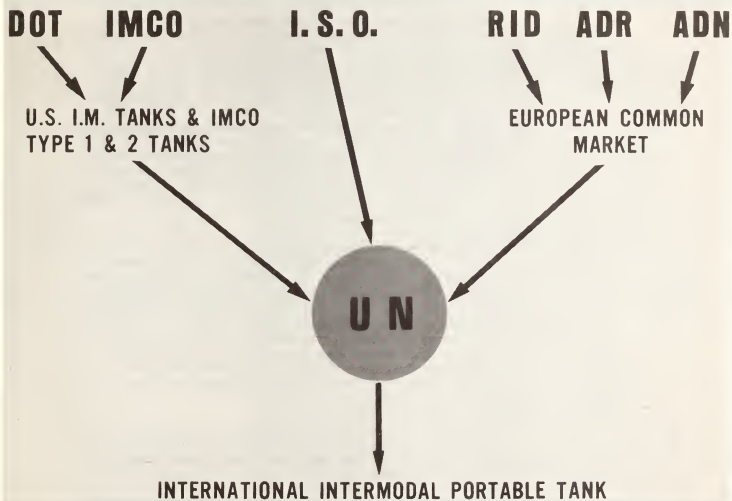


Figure 2

QUESTION and ANSWER SESSION II

David B. Letteney

(Farrell Lines) - The Federal Highway Administration has regulations governing the transport of tank trailers over the highway in terms of overturn protection and so forth. How do you handle tank containers moving on a standard skeleton chassis? I realize you don't technically identify tank containers as motor vehicle tank specifications, but for an operator who wants to transport his tank containers filled with a hazardous commodity over the highways, how do you handle special permit requirements? In other words if I built some tanks, I can go through the routine of getting special permits for the tank, but then I would have to be able to demonstrate that my chassis will meet Motor Vehicle Safety Regulations, particularly in the area of rear-end protection where forces of 2g must be absorbed. Similar unique modal requirements are all superimposed on intermodal operations.

William J. Burns

(DOT - Hazardous Materials Regulations Board) - Hopefully, of course, the ultimate objective of standardization would be uniformity at some point in time, then when you have a truly intermodal container that will move by sea transport and would be accepted for both highway and rail transportation in the states, otherwise you wouldn't be achieving your objective. Now with regard to what is being done today, we have several gentlemen here from the Federal Highway Administration. I would like for them to address themselves from that point if they will.

Donald Morrison

(DOT-Bureau of Motor Carrier Safety) - A special permit would be for the container itself. Concerning the chassis that the container is being transported on over the highway, there is a set of Motor Carrier Safety Regulations that apply to that vehicle. The container is merely a piece of cargo being transported just like you would transport anything else on a flat bed trailer. There is no special permit requirement needed for the chassis. It is only for the container.

Mr. Letteney

It strikes me as being a basic problem in specs in trying to dovetail the two together because we may be dealing with say 10,000 chassis none of which meet the highway requirements. The container may have the apparent strength but it has not been demonstrated. Do you follow what I'm saying?

Mr. Morrison

Well, no. I don't see how you can put the rear-end protection requirements on the container if it is sitting up four feet or forty some odd inches in the air when the rear-end protection requirements say that it has to be down within 30 inches to the ground whenever it's loaded.

Armour S. Armstrong

(MarAd) - Excuse me before we get too far in this. We've got a presentation coming up by Larry Botkin who's going to deal with this subject. So we will await the presentation on equipment before digging too deeply into the subject of rear end protection of tank containers.

Mr. Morrison

I feel Mr. Letteney is looking at two different things. There is no special permit requirement for a general dry freight container insofar as Motor Carrier Safety Regulation of parts and accessories is concerned. If it were a tank truck operating over the highway with hazardous materials in it, a special permit would be required. The Motor Carrier Safety Regulations still would have to be complied with concerning lights, brakes, tie downs, etc. Special permits do not enter into the running gear.

Capt. Robert G. Schwing

(U.S.C.G. - Cargo and Hazardous Material Div.) - The tank container that will come out in the proposed DOT intermodal specifications will be acceptable by all modes. With regard to its chassis, however, we are just starting to talk about the problem in IMCO in London at the next session. I don't know how much is going to be done or how soon. But I would merely echo the answer of the highway people that the tank container itself is posing no problem between the modes in the new DOT intermodal tank specifications.

Jack Merkl

(Sea-Land Service) - Capt. Schwing, the last slide that you had in your presentation had in it the input into the ECE regulations of which prior slides had the RID and ADR, there was another group of symbols indicated on that last slide, the ADN. Could you explain what that stood for?

Capt. Schwing

That is the Rhine Navigation Group. By showing the various international bodies, I was merely showing the complexity of a very difficult problem that will face the United States delegation to the UN. That is, the balancing off of the requirements by ADR/RID which show up in the Economic Commission for Europe (ECE) versus the IMCO requirements that show up for world wide maritime interests. Sooner or later we are going

to have still another problem which is how to respond to the views of the rest of the world, especially Asia. All these regional interests will appear when the UN begins its review.

John Funke

(Prudential Grace) - Capt. Schwing, I don't want you to be a soothsayer but what is the prognosis of the Coast Guard getting approval of the composition collapsible tank? We've been talking here about high grade stainless steel tanks. But, can you give us any light on what might be down the road on the acceptance of collapsible tanks to solve some of the water and land carriers' off-balance problems?

Capt. Schwing

I can only do it in general terms; we have just started to examine this subject. There are many problem areas which have yet to be resolved. The approach the Coast Guard is taking is to identify and define the problem areas. Once this is accomplished we can, hopefully, resolve the problems which persist.

TANK CONTAINER EQUIPMENT
STANDARD SPECIFICATIONS FOR TANK CONTAINERS

Vincent G. Grey
Chief, Equipment & Systems Design Branch
Maritime Administration

This morning you heard shippers and carriers speak about experiences using tank containers. Although they may be standardized within their respective companies, without exception these tank containers are "non-standard" containers in a broad industry sense because, as a matter of actual fact, we do not have a national standard or international standard tank container specification approved as yet. Close? Yes! I have here a copy—the only copy—of the final draft on tank containers which is to be processed for final approval by the American National Standards Institute (ANSI) and here is the final draft of the ISO Standard on tank containers now out for letter ballot approval of the ISO member nations.

What kind of tank do we find moving in container operations? Today's tank containers are commonly made to the dimensional and operational requirements of standard closed van containers, with a design patterned after tank motor carrier safety regulations, whose construction has been approved by the U.S. Coast Guard and whose operator has been given a special permit to transport particular hazardous commodities.

It is only now that, within ANSI and ISO, we are dealing with tank containers for general usage by the shipping community which combine the design factors essential for safety with those design factors essential for economic transportation.

We have had tank containers moving in captive systems like Sea-Land's where the container always remains within the operational control of Sea-Land personnel. We have also had tank containers moving in dedicated commodity service, like Union Carbides'. But what we are reaching for in the standards activities is the establishment of a set of specifications for off-the-shelf, "plain vanilla" type tank containers. They will be available for service up to certain operating pressures. Their design characteristics will be so familiar to regulatory agencies that type approval will be the common occurrence and thereby avoid the time consuming study of each set of engineering specifications by Coast Guard staff.

Let's take a look at what elements are dictated by regulation and which ones by industrial standardization: (This excludes braking, lighting, overall height, width and length and similar general motor vehicle operating requirements.)

DOT Regulations (Applies to hazardous only)

1. Pressure vessel design safety factors
2. Emergency venting
3. Specifications of materials for the tank construction
4. Marking of tank design features on identification plate and attachment of certification plate.
5. Placarding
6. Matching of commodity with tank specification
7. Percentage of outage for various commodity classifications
8. Permissible stowage locations during transport and design inertia loadings
9. Loading and discharge requirements
10. Shell test and retest provisions
11. Protective requirements in event of accident.

ANSI/ISO Standardization

1. Sizes, dimensions and tolerances, ratings
2. Selected design working pressures
3. Handling characteristics (corner fitting design, approved lifting and transferring methods)
4. System design features (stacking, racking, restraint)
5. Marking of container with owner, country, serial, type and size codes, etc.
6. Designed for non-hazardous as well as hazardous
7. Optional feature specifications (catwalk, ladder, tunnel, straddle carrier lift pads)
8. Design load factors for rail, highway, marine modes and terminal operations.

The proposed ANSI and proposed ISO standards are in agreement on tank essentials. In large measure this is due to the efforts of Larry Botkin of Fruehauf, Gene Binda of Sea-Land and LCDR David Whitten of USOC. Five basic tanks are being standardized at various pressures (which I will show you in a moment).

These numbers may appear peculiar but they are derived values based on technical definitions of a liquid and a gas. Quite importantly they provide a common ground for tank design which appear to be acceptable not only in the U.S. but in other participating countries as well.

There is provision for designing to higher pressures ultimately but specific values have not been chosen. However, the tanks covered by the selected pressure ratings cover 99% of all tonnage moving in tank containers now, or likely to move so in the foreseeable future.

The proposed ANSI and ISO standards cover non-hazardous and hazardous products. This is understandable because the tank does not know whether the loading being exerted against it is due to a hazardous liquid or not. In other words, as a liquid surges against the heads during rough seas, the impact is responding to the laws of physics rather than chemistry. The manufacturer builds a known strength capability into the tank to handle the physics and it is up to the regulatory authorities to declare how much over-design they feel is necessary to safeguard against the risk of accidental escape of the products involved.

All things considered, here is the complete list of standard tank container designs and their planned DOT specifications:

TANK CONTAINER

Standard Code Designation	Commodity Class	Minimum Test Pressure (PSIG)	Applicable DOT Specifications
70	non-hazardous	6.40	none
71	non-hazardous	21.35	none
72	non-hazardous	43.00	none
73	(reserved)	—	—
74	hazardous	21.35	DOT - IM 100
75	hazardous	37.40	DOT - IM 101
76	hazardous	43.00	DOT - IM 101
77	hazardous	56.90	DOT - IM 101
78	hazardous	> 56.90	DOT - IM 102, DOT-51
79	(reserved)	—	—

Let us look at an example. Suppose we take one of Mr. Fazio's commodity groupings of scotch whiskey coming into the country and coca-cola syrup going out. The scotch is the more volatile product and since Coast Guard requires a tank design $1\frac{1}{2}$ times the working pressure, the standard tank to be used would be a Number 74 tank having a test pressure of 21.35 psig.

If Mr. Fazio were bringing scotch in but sending acetone out, he would order a Number 75 standard container of 37.40 psig. This particular tank would be able to transport not only the acetone but any compatible commodity with vapor pressures up to 25 psi @ 122°F or other hazardous commodities whose classification of risk warrants the use of this higher rated tank.

I mentioned coca-cola syrup. Here is a good opportunity to distinguish between the regulatory agency interest and that of the standards activity. Because coca-cola is not regulated, the regulatory groups are not concerned. However, the shipper, the marine carrier and land carriers, the insurance companies and so forth are very much concerned since their business is related to delivery of the goods. So, these groups are anxious to prevent a seam from opening up on the tank container even if the commodity is syrup, molassas, orange juice or lard or any other non-hazardous commodity.

The standards also speak of those environmental factors imposed on the tank container. Such factors as lashing capability, racking strength, stacking loads, restraint and similar considerations due to gravitational or inertial conditions of transport.

Likewise, design criteria are established for the catwalks, ladders, base structure and so forth. It might be of interest to know that fork pockets are prohibited by both the proposed ANSI and ISO standards. This was decided in spite of the popularity of this method of terminal handling. If the tank container would be carried on forks only when empty, the standards groups would have probably included them as optional features, similar to other types of containers. However, recognizing that hazardous commodities would also be involved and recognizing that bulk liquids have inherently unstable behavior when partially filled, the use of fork pockets was banned in both the ANSI and ISO standards. I expect that this issue will be discussed again when the ANSI draft reaches the highest forum in ANSI, but I am reporting it to you the way it presently reads.

The standard for tank containers has three elements: design requirements for the structural framework, design requirements for the tank shell and specifications for optional features. A tank container must display the same ability to survive the rigors of service in a container system just like closed vans. Also the dimensions and tolerances for length and width are the same as for vans. However, because the densities of liquids are almost always greater than those common to general dry freight, the height of a tank container may be less than the standard van height of 8 or 8½ feet. The half height of 4 feet 3 inches is

typical for longer containers of 35 or 40 feet, whereas the full height is mainly used for 20 or 24 foot sizes. The weight rating of the tank containers are the same as the closed vans. For example, a 40 foot container has a maximum gross weight of 67,200 pounds (30 long tons) regardless of whether it is a tank type or a closed van, reefer, platform, and so forth, in order to keep uniformity within the family of standard containers.

The new ANSI standard I have been describing will be entitled American National Standard Requirements for Tank Containers for Liquids and Gases, MH5.1.3-1973. To obtain a complete specification, it will be necessary to use this together with the standard that covers details common to all freight container types, Basic Requirements for Cargo Containers, MH5.1-1971. The work on dry bulk containers is still progressing but is not expected for completion until early in 1974.

Without doubt tank containers are costly to buy. However, if their use can be extended to permit the carriage of numerous commodities, the likelihood of good economic return is enhanced. Our objective in preparing the standards for tank containers is to expand their usefulness to many shipper groups so that deadheading will be minimized. The more attractive the shipment in portable tanks becomes, the more tank containers will be put into service. The more containers in service, the more readily available they become. American flag ships are bound to play a big role in such an evolution.

In conclusion, I would like to leave the impression that the dovetailing of revised commodity listings, with the new DOT safety specifications for portable tanks and the standards for the construction of tank containers put us on the threshold of a new era. The transportation of bulk liquids in containers hopefully will pass from the stage of a new phenomenon to the stage of a common occurrence.

Thank you.

TANK CONTAINER EQUIPMENT
TANK DESIGNS

Lawrence A. Botkin
Division Chief Engineer
Independent Metal Products
Division of Fruehauf Corp.

We have been fortunate to have such a complete outline of shipper experience, material and equipment regulations, and standard specifications as a background for discussing the hardware or the equipment necessary to implement profitable carriage of liquid and dry products in bulk.

Perhaps the most meaningful way of discussing basic tank container designs is to look at the finished product — the part that brings in a profit.

While on wheels, the large intermodal tank which is our primary subject matter is considered a trailer tank under existing D.O.T. motor carrier regulations when transporting regulated products — such as flammable, poisonous, or corrosive liquids.

The intermodal tank container of various types can fall into any class of tank truck specification if hauling a regulated commodity, or it can be a non-specification vehicle.

The density or weight per gallon of most liquid commodities is high enough to achieve the desirable gross container weight without using the full available height when tank containers over 30 feet long are considered.

Transport of empty containers illustrates the fact that two of the half height units may be stacked to be the equivalent of one standard module. (See Figure 3)

Such stacking aboard ship is used to obtain greater payload.

The available space or cube plus the higher allowable weight per linear foot which characterizes containers less than 30 feet long makes the full module height container more popular. (See Figure 4)

Several varieties of containers of this type have been produced, with this being a typical example of an earlier tank container for handling flammable liquids.

Both non-insulated carbon steel (See Figure 5) and insulated stainless steel tank containers have been produced for handling various products.

It will be noticed that, although the handling of loaded tank containers by forklift trucks is not recommended practices, fork pockets or their equivalent are often specified for handling the empty containers.

From a structural standpoint, the fork pockets serve the function of providing proper bearing between the tank container and the chassis to prevent the chassis from bending under imposed loads, especially when placed on the support legs.

This combination of tank container, chassis, and tractor illustrates the typical location of fork pockets or equivalent crossmembers approximately over the container chassis support legs. (See Figure 6)

The tank container itself illustrates a different design concept wherein all of the loads characteristic of containers, such as stacking, racking, lashing and lower fitting restraint, are withstood by an external framework.

The tank itself is then suitably mounted within this external framework.

In this instance, a lightweight stainless steel tank is illustrated.

It would be suitable for handling the great majority of the products currently being handled in tank containers.

The same external truss design concept is applied to a higher pressure vessel such as would be used for transporting poisonous materials or corrosives.

Tank containers for compressed gasses have used a similar design, with appropriate tank fittings and valves.

We can now examine the design and construction techniques which are characteristic of the two basic construction concepts. Here we see the internal barrel assembly used in the twin barrel self-supporting style of tank.

A somewhat similar arrangement is available from European sources wherein a single convoluted style of tank with a rectangular cross section and an internal shear plate is used rather than two approximately cylindrical tanks.

Structural members are integrated with the tank structure. The framework bracing fixes and positions the corner fittings.

Side structural members are common to reduce the effect of handling accidents.

The twin barrels are inserted through a shear plate at each end frame for secure attachment.

Careful attention to design details is necessary to avoid stress concentrations in the tank shell.

The twin barrels are jointed by a liquid equalizer at the rear which incorporates a heating member in this instance.

The equalizer terminates in the outlet flange which is later fitted with the internal emergency valve and the discharge control valve. (See Figure 7)

The vapor spaces in the two barrels are connected by a vapor equalizer which is integrated with the manhole collar assemblies and the vent fitting. (See Figure 8)

Since the tank is later insulated, the manhole area is equipped with drains passing between the two barrels.

The barrels are wrapped with fiberglass insulation (See Figure 9) and later covered with stainless steel jacketing material.

Since it is very important to prevent entry of sea water into the insulation area, a sealant tape is applied to individual jacket sheets before installation.

The finished insulation assembly incorporates a top walkway, recessed tunnel area for fitting a gooseneck type chassis (See Figure 10) and structural supports at the rear and bolster areas for proper mating to the chassis.

The rear of this type of tank container normally includes an access ladder.

Space for the access ladder does not detract from the available cargo space or length since D.O.T. motor carrier regulations require that the end of the tank and the liquid fittings be at least 6 inches from the rear of the vehicle.

The lower crossmember incorporates the structural strength required for rear end protection.

The design and manufacturing techniques for the external truss type of tank container differs considerably from what we have seen.

In this case, a 100 PSI pressure vessel is constructed per the requirements of the asme pressure vessel code (See Figure 11.).

All tank containers are provided with access manholes for production, inspection, and testing.

Welding techniques as applicable to the tank material are used in production.

Butt joints between the shell and the head are almost universally used and are mandatory for most pressure vessels.

The individual tank is then completed on a tank line (See Figure 12).

After final inspection and a preliminary hydrotest, these particular pressure vessels were stress relieved.

The mounting rings and integral bolster plates are clearly illustrated in this view.

In another section of the shop, the complete container framing truss has been subassembled (See Figure 13).

The external truss may be slipped over the completed tank (See Figure 14) and appropriate structural connections completed (See Figure 15).

The finished container is then ready for service.

In event of corrosion or damage, the tank or frame may be replaced or repaired as separate structures.

The particular tank container illustrated is for hauling a poisonous material.

It is a DOT-51 tank with a working pressure of 100 psi and is phenolic-lined.

In this instance, the 6 inch clearance required for rear end protection is not incorporated in the container framework but is provided while in transit on the highway by having the rear of the container chassis project beyond the rear of the container.

Since shorter chassis are more popular today, current designs include rear end protection in the framework and the required 6 inch clearance dimension for transportation of D.O.T. motor carrier regulated products.

Lightweight stainless steel containers can also be provided with an external aluminum truss for additional weight saving (See Figure 16).

Rear outlets are quite common. A cabinet or housing around the valve facilitates meeting Customs or TIR requirements. This style of outlet valve permits handling liquid or dry bulk products as alternate loads in the same tank. A remote trip for the emergency shut off valve feature is necessary.

Ladders and walkways of various configurations provide safe access to the top of the tank. This is necessary for access to the tank fittings and also facilitates loading aboard ship in some cases. An open type walkway is common to prevent the accumulation of dirt or water (See Figure 17).

Covered hatches may be provided over the manhole so long as the functioning of vents is not obstructed.

Integral heating systems are common for both insulated and non-insulated tank containers (See Figure 18).

By careful attention to design and manufacturing details, various tank container suppliers have produced equipment which has given an excellent safety record. Stainless steel has been the predominant material used in tank construction for two reasons. The first reason is that the various alloys of stainless steel are resistant to many types of commodities as well as the salt water environment. An equally important consideration is that a smoothly finished stainless steel tank interior may be easily cleaned so that various types of commodities can be carried on subsequent shipments with practically no danger of contamination.

A sample of various commercial weld finishes is available for your examination.



Figure 3



Figure 4



Figure 5



Figure 6

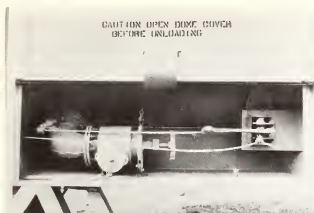


Figure 7

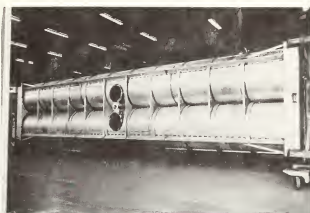


Figure 8



Figure 9



Figure 10

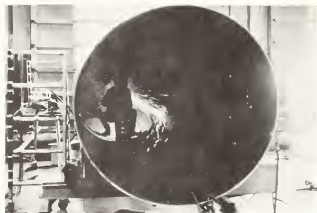


Figure 11

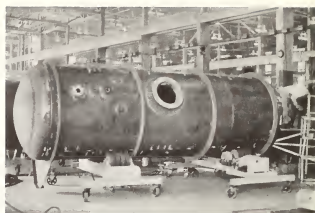


Figure 12

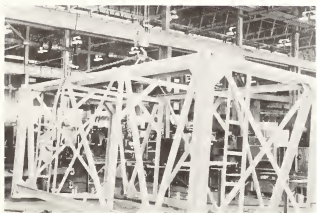


Figure 13

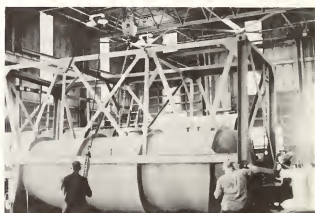


Figure 14

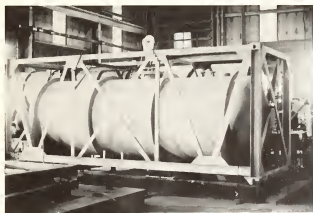


Figure 15



Figure 16



Figure 17



Figure 18

TANK CONTAINER EQUIPMENT
OPTIONAL EQUIPMENT

George A. Rea
Vice President
The Heil Co.

Previous speakers have discussed regulations and specifications for liquid tank containers while Larry Botkin has covered very nicely two basic types of tank containers being used today.

I would like to cover some of the accessory equipment necessary for tank containers hauling hazardous and non-hazardous liquids as well as design options possible depending on the products involved.

Generally speaking all liquid tank containers require:

1. Manhole cover
2. Pressure vent
3. Vacuum vent
4. Outlet valve

In addition, tank containers may optionally require:

1. Inspection hatch covers
2. Cleanout fittings
3. An additional outlet closure in the event there is an emergency valve
4. Emergency venting in the case of hazardous liquids

Manhole covers are required to be a minimum of 18" in diameter for ease of entrance to the tank for inspection, maintenance and repair. The vertical space available at the manhole opening dictates the cover design - for example, an 8' x 8' x 20' round tank container would undoubtedly have vertical space available for a conventional, dished cover as depicted in Figure - (not shown) while an 8' x 35' x 51" twin barrel container would require an extremely low profile cover. This style of cover is shown in Figure - (not shown). Since liquid containment on board ship is a must even for non-hazardous products,

Note: Not all the slides used in Mr. Rea's presentation have been reproduced in this text.

manhole covers are designed for a minimum of 14.9 psig operating pressure even though the required containment pressure may be less than this figure. The actual working pressure of the tank determines the cover design - in the case of the new IM101 tank container this would be a minimum of 15 psig and a maximum of 43 psig with the typical unit in the 25-30 psig range. In the case of a tank for hazardous products, the manhole closure is protected from damage by designated guards.

Every liquid tank container requires a spring loaded pressure relief device to prevent tank rupture in the event of overpressurizing during operation or in the event of fire exposure. This valve is located on the top of the tank as near to the mid-length as practicable and set to be fully open if and when the internal pressure ever exceeds the tank's test pressure. Figure - (not shown) illustrates a typical container vent - the left hand poppet type valve is the pressure portion of the vent. In the case of hazardous products, emergency venting is also required. The emergency venting capacity necessary is related to the external area of the tank and whether the tank is insulated or not (provided the insulation remains effective at temperatures associated with fire conditions). The emergency venting can be spring loaded, responsive to elevated temperature (IM100 specification tanks only) or responsive to elevated pressure (frangible devices). The vent illustrated in Figure - (not shown) incorporates a fusible section just inboard of the flange holes to react to elevated temperature.

To prevent vacuum collapse during operation or cleaning, all tank containers require a vacuum vent set to open at 3 psig external pressure or in the event no vacuum relief device is used the tank is designed per applicable pressure vessel codes to withstand an external pressure of 6 psig. The right hand poppet valve shown in Figure 3 is the vacuum portion of this vent.

Figure - (not shown) depicts a pressure - vacuum vent designed specifically for half-height module, Specification IM101 tank containers. It has a low silhouette and as required by IM101 accomplishes the necessary outbreathing (pressure) capacity by means of spring loading. This vent is designed for 30 psig

operating pressure and has a capacity of 121,680 cubic feet of free air per hour at 45 psig and a vacuum vent capacity of 576 cubic feet of free air per hour at 5 psig.

The discharge outlet of the container requires a valve - in the case of a non-hazardous product this may be a gate valve. A typical valve popular for this application is shown in Figure - (not shown). In the event the container is designed for hazardous commodities, the product discharge opening is equipped with a self-closing shut-off or emergency valve as illustrated in Figure - (not shown). This valve, in addition to the normal closing means, will be closed by an automatic heat actuated means (effective at not over 250°F) and a remote, secondary, manual closing means for operation in event of fire or accident. Standard practice also dictates the use of an additional closure or valve on the outlet side of the emergency valve. This can be a gate valve as already referred to in Figure 5 or a valve of the type illustrated in Figure - (not shown) which is designed to be easily disassembled and cleaned.

Figure - (not shown) schematically depicts the outlet piping and associated control mechanisms of a twin barrel tank container. Item 4 is the emergency valve, Item 6 the outlet valve, Item 28 the remote closing means, Item 12 the operator incorporating a fusible release, etc.

In addition to the optional tank designs referred to by Larry Botkin, there are also other options available to the tank container customer. These include:

1. Tank material - stainless, aluminum and steel. In addition, for certain combinations of commodities and shell material, some shippers have employed the use of various types of inner linings.
2. Pressure unloading.
3. Insulation - thickness, type.
4. Jacket material in the case of insulated tanks - stainless, aluminum, steel, plastic.
5. Heating
6. Cooling

Because of the versatility of the stainless steels (304, 316) most containers are being constructed using these alloys. Aluminum and steel are also used but generally only when a container is going to be dedicated to a single commodity use. In addition, aluminum is not a recommended tank material for flammable or combustible liquids aboard ship.

Tank containers can be insulated with several inches of fiberglass, urethane foam, etc. The insulation is not intended to keep commodities at elevated temperatures during an entire voyage but it is necessary to economically reheat the product and maintain temperature for the over-the-road portion of the journey at destination.

Heating devices are often required on insulated tank containers. Heating is generally accomplished by means of a "hot wall" on the bottom of the tank. This can be a longitudinal corrugation, a button welded steam pan, etc. The heating media generally is steam with a maximum operating pressure of 150 psig. A relief valve, strainer and steam trap are required accessories for a hot wall. Figure - (not shown) is a photo of a hotwall on a tank trailer while Figure - (not shown) shows a tank container incorporating a heat panel.

Electric heating is also possible through the use of electric strips or blanket heaters placed next to the shell inside the insulation. Figure - (not shown) is a photograph of an edible food tank container incorporating electric heat.

Tank product cooling is also possible through the use of a refrigerant and a "cold wall" on the shell rather than a "hot wall".

In the closing moments of my portion of this Conference I would like to briefly discuss the field of Dry Bulk Tank Containers.

In addition to the requirements for intermodal liquid tank containers there is a definite market surfacing for dry bulk containers for the transportation of plastic pellets, resins, cement, flour, etc.

This type of container requires a similar structural integrity to that of liquid tank containers as regards stacking, lifting, internal and external restraint, etc.

Depending on the unloading method and the product involved, designs for hauling dry bulk commodities have funnelled into two categories - round tank type units and box type containers.

As in the case of liquid tank containers, the container material can be stainless, aluminum, or steel. Aluminum is popular since it is resistant to most of the products hauled and it is lighter and cheaper than stainless.

Let's discuss the box type units first. Products hauled in this type of container are free flowing substances that do not require fluidizing. This type unit cannot resist internal or external pressures beyond a fraction of a pound.

Box type containers require some sort of hoisting apparatus or tipping frame for unloading the product at final destination. Internal slope plates are required at the discharge end of the box to assure complete product clean out. Figure 19 and Figure - (not shown) illustrate the type container under discussion with the tipping frame and the internal slope plates mentioned above.

Manhole covers, inspection hatches and an outlet valve are obviously necessary. Depending on the product involved plus the temperatures at which it is handled and the unloading conditions, low pressure vacuum and pressure vents may be necessary.

Round, tank type containers can be unloaded by one of the following means:

1. Gravity discharged by means of a tipping frame as shown in Figure 20.
2. Unloaded by a combination of tipping and fluidizing with air pressure - this is the type of container illustrated in Figure - (not shown).
3. Pressure unloading by means of the conventional hopper design and aeration devices - the tank containers in Figures 21 and 22 are designed for unloading in this manner.

These are:

1. If product flows freely, internal slope plates are not necessary at discharge end.
2. The container is much less prone to handling and shipping damage.
3. Cost and weight is less, due to the inherent strength of cylindrical shaped objects.
4. Pressure and vacuum resistance is greatly increased making venting much easier to control. Venting may perhaps even be unnecessary.

The "air unload" type containers are generally designed to be unloaded along the lines of conventional dry bulk trailers. These containers have the relief valves, air assist lines, blow down lines, product valves, etc. necessary for proper unloading of the dry bulk product. A typical container for handling cement designed for pressure loading and air unloading is shown in Figure - (not shown).

The design of dry bulk and liquid bulk containers has been simplified due to the experience accumulated in the truck trailer industry. By building on this experience in design, production and operation, we have been able to circumvent what might have been trial-and-error product development in the tank container field. As the industry that spawned the intermodal tank container, we are ready and willing to serve your needs in achieving greater implementation and more efficient utilization of tank containers.



Figure 19

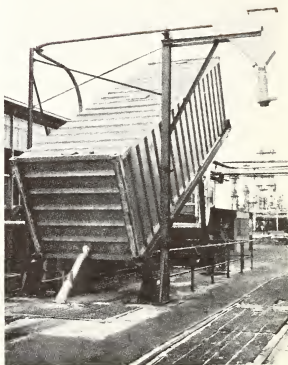


Figure 20

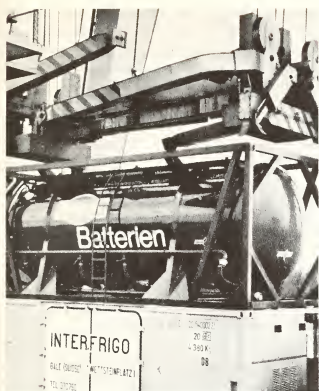
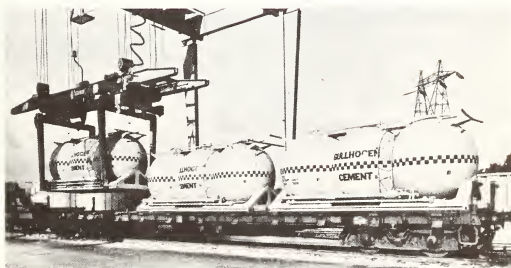


Figure 21

Figure 22



QUESTION and ANSWER SESSION III

- Gary Misch (Maritime Administration, Office of Market Development) - I have a question for the manufacturers of the tank containers. I was wondering if they are doing anything to assist U.S. flag carriers in developing markets for their new type tank containers, etc.
- Larry Botkin (Fruehauf Corp.) - That question is a little difficult to answer because, as manufacturers, we do not normally become exposed to the people who would be the customers of the carriers. We do make every effort to cooperate particularly from a technical standpoint because this is usually where the questions are raised. We have helped work out handling devices, tippers, conveying devices, etc.
- Mr. Misch You do this more or less on a one-to-one basis, trying to resolve a specific problem for a given shipper.
- Mr. Botkin Our participation in Coast Guard advisory panels, ISO, IMCO and organizations of this sort might be considered in that nature too.
- Mr. Misch I see you feel that this type of exposure gives you enough feeling for the market to develop new types of containers.
- Mr. Botkin Generally speaking, yes, I believe that it does, because the other parties who participate are usually those active in and most knowledgeable of the other areas involving containerization.
- Donald Morrison (DOT-Bureau of Motor Carrier Safety) - I would like to ask Larry Botkin for clarification. If I understood you right you said that there is a Federal Highway Administration requirement that valves had to be within six inches from the rear of the portable cargo tanks.
- Mr. Botkin That does not exist at the present time for every specification tank. In the DOT MC 306, 307 etc., there is a requirement that the vessel itself or its valves and fittings which might contain product while in transit, shall be located at least six inches from the rear-end protection. In other words, you must have a six inch clearance. But, that stipulation is not in the existing DOT 51 tank container specification.

Mr. Morrison OK. Now was it the six inch recess that required the deviation that you mentioned which seemed to be required or were you referring to the need for a deviation from the rear-end protection requirement?

Mr. Botkin It's the deviation in the location of the rear-end protection that is now part of the special permits.

Mr. Morrison Only for cargo tank motor vehicles. There's no deviation that I know of or authority to deviate from the requirements of Section 393.86 which is the rear-end protection provision for all motor vehicles.

Mr. Botkin No, you are talking about (if you'll pardon the improper but still utilized expression) the "ICC Bumper".

Mr. Morrison Now I understand.

Mr. Botkin We're talking about the "big" bumper required for transport of hazardous commodities, not the "little" bumper required of all motor vehicles.

Mr. Morrison I think that we ought to get away from referring to the "ICC Bumper" because motor carrier safety has been out of ICC since April 1, 1967.

Mr. Botkin Right! It simply stems from the need to differentiate between the two types of bumpers. Any highway chassis whether it had a tank container or any other type of container on it has to have rear underride protection at the 30 inch maximum height from the ground and within a certain distance from the rear-end. There is a much more stringent requirement for rear-end protection when handling hazardous materials. This is the one I was talking about.

Mr. Morrison OK. I think I ought to point out to these gentlemen that on July 1, 1973 there will be some cargo securement requirements applicable to containers that we recently have issued in 393.85 of the Motor Carrier Safety Regulations. It will require that the containers be secured on vehicles and not move more than $\frac{1}{2}$ inch in any direction under accelerations of 1.70g downward, .50g upward and .30g laterally and 1.70g longitudinally.

William F. Black (DOT Federal Railroad Administration) - One thing probably should be made clear at this point because I heard some allusion this morning to the difficulty that tanks have when the railroads switch these tanks in railroad yards.

For this reason -- we see this for the foreseeable future -- the FRA feels that we are going to have to operate these tanks in the rail mode under a special permit. The tank itself is not what gives us the problem but the chassis, the securing devices, etc. We've been requiring the successful passing of an impact test. The real problem is that we just haven't seen enough of a "standard" design to know what will pass our impact test and what will not. Sometimes we will only test a selected few from a production run in order to know what will pass the impact test capability without testing everyone of them. I don't think we have ever had trouble with the tank itself, but we've broken up an awful lot of fittings. So I think you're going to see special permit operation continued by rail firms at least for the next few years.

W. G. Pennell

(PPG Industries)- As a shipper, I am interested in the new standards that are being made up for these tank containers. What impact does the U.S. road and rail regulations have on the standard specifications versus what type of ship these containers are carried on? What impact do European road regulations have on the standardization of these containers? Are they more stringent or less stringent than they are in the United States?

Vincent Grey

(MarAd - Office of Ports and Intermodal Systems) - Both the U.S. and the foreign transport modes have had to put down on paper what design criteria they would impose upon a container, not just a tank container but any container. We did run rail impact tests and out of this came the 2.0g restraint requirement for containers. We ran ship roll calculations based on a 30 degree roll in a 15 second period. From these we determined what the longitudinal and lateral loadings would be on containers. Out of those studies came certain inertia loadings on the tank, which will be in the standard, 1g on the tank shell and its mountings longitudinally, 1g laterally and 2g downward. The downward loading of the tank on its mounting is determined when the tank container is landed onto a highway chassis. So to pull it all together, the various transport modes in Europe, here in the U.S., and I'll even say the Far East, have had to study their rail, marine and road operations to make sure that, in transit, they would not impose forces on the containers higher than those used in container construction standards. Over the years, the container design standards have demonstrated by performance that the design factors were safe and yet practical.

Mr. Pennell

This is true on all types of vessels?

Mr. Grey

Although our studies go back to when containers were first appearing on the scene, we've seen no justification for increasing or decreasing them. They seem satisfactory the way they are.

Mr. Armstrong

I think it fair to say that those figures emerged from the first generation of cellular ships. Subsequently, when we got into the bigger trans-ocean vessels and smaller feeder vessels there were some different figures kicked around but really not enough to change the fundamental design of the tank. The U.S., pushing for intermodal operations in Europe starting in 1966, was the principal force that brought out the difference that existed for many years between highway and rail modes. Europe was choosing either one mode or the other; they weren't transferring back and forth. When we began arriving with containers that had to be set up to move on truck one time and rail the next, we started the Europeans to focus on the fact that they have these differences. So we started measuring what was required for safe ocean transport in the IMCO standards activity. We also tried in ECE to get in with the rail and highway people in Europe. As I recall at some of our meetings in about 1968, we concluded that you really couldn't build a container which simultaneously met all three modal requirements. So its been an evolving situation over the last seven or eight years and I can't really say that there was any one answer that says that some other country was more strict than we were. But with the inter-modal demands that have been coming along there's been some headway made now.

Mr. Grey

There was one operational practice that was excluded, athwartship orientation of the container in the marine mode. This was specifically excluded because of unique types of dynamic loading that would be generated when the length axis of a container was transverse to the ship's axis. That was the one exclusion.

I think its important to point out that there is a basic difference between ISO and ANSI MH5 work. Within ISO, we have lumped together all the criteria from the various modes and out of that have taken the most severe requirement from any modes, placing these in the ISO standards and making them applicable to all containers. Within ANSI MH5 we have separately identified each of the modes of transport and their respective design criteria. In ANSI MH5 you are free to go into the container specification and establish a standard container based on any two modes

of transportation. You can come out with a rail/highway combination. You can come out with a marine/highway combination or a marine/rail. When one selected mode establishes a more severe criterion you must automatically adopt the more severe criterion as a minimum. So you have many combinations in this ANSI activity.

Mr. Pennell

You've answered one of my questions. I know of another point of conflict as I see it. Present FHA requirements for tank trailers require a remote shutoff on the discharge valve as Larry Botkin pointed out. I believe there was a comment about a fusible plug that achieved the same object. Tank containers built in this country have this requirement. Foreign built tank containers do not have them to the best of my knowledge and this is a point of conflict.

Capt. Robert G. Schwing(USCG - Cargo and Hazardous Material Div.) - We're going to have a problem because the UN Committee on the Transport of Dangerous Articles in Geneva, is not willing to accept, at least not at the present time, the use of fusible plugs as an emergency venting device.

Mr. Pennell

We again get to the point of conflict with Don Morrison and the Bureau of Motor Carrier Safety. Is the BMCS going to permit these foreign tank containers to move over our American roads even if they do not have this remote shut-off valve?

Mr. Morrison

If I understand you right there are certain foreign containers that do not have internal shut-off valves or fusible elements. I am not in a position to answer it completely because I am not working strictly in the hazardous materials area at this time. However, if there are such containers, transporting hazardous commodities, it seems to me that they would have to meet prescribed DOT specifications. There is a possibility that a special permit could be issued but if such were issued I am sure there would be stringent requirements in the permit that might not make it economically feasible to use. That's the only thing I can answer at this time.

Mr. Pennell

My point is that this is another area of difference.

Mr. Botkin

I think that the real intent of the internal emergency valve requirement is to protect the public while the container is being unloaded. Actually, it was developed and employed primarily as a gasoline delivery truck safety

precaution. It is applicable to tank containers, and will become a part of IM 100 and IM 101. There is no thought of changing it as far as the United States is concerned. It is not a requirement in Europe or other areas in the world but we have found over the years a tendency to adopt our DOT regulations. After several accidents, the reasons for certain USA requirements are seen little more clearly. They see why those things are there.

Angus Black

(Interpool Container Leasing) - Mr. Botkin, in the 20 ft. tank container you mentioned the fact about the fork lift pockets assist as load bearing members when the container is placed on the chassis. As the chassis bends, it takes up the weight more easily. And yet Mr. Grey tells us that the fork lift pockets are out for standard tank containers. Do you see any problems structurally with the manufacturer?

Mr. Botkin

Well, there are problems structurally from a manufacturing standpoint with or without fork pockets. My company puts the cross members in. Frankly, I've been sort of a minority of one in regard to the use of fork pockets in 20 ft. containers. Not that I have an ax to grind one way or another. All of them we have ever made had fork pockets in them. The problem of structural mating of tank containers to the chassis has been a significant problem.

Mr. Grey

This problem of chassis contact is not limited to just tank containers. Any 20 ft. container where you only have contact at the four corner fittings creates a problem on the skeleton container chassis. At this time, the subject is being raised within ISO to establish where contact points will be located on all standard containers which will permit matching load bearing pads on the chassis. There is a growing recognition that additional load bearing points have to be provided. What we want to do is standardize where those contact points will be positioned so that regardless of who makes the chassis or who makes the container they can always reasonably expect the load to be born on those points. So whether or not those container load bearing points will serve the dual purpose of a fork pocket and a load bearing point remains to be seen. As I mentioned in my talk, the present wording of the draft standard prohibits fork pockets at this time. It will now be presented to a large, parent committee and I know that there are people there who share Larry's view that fork pockets ought to be permitted. This one issue therefore is not fully resolved yet.

Mr. Armstrong Have any shippers considered LASH barges for use as tank containers in foreign trade? Secondly, are inland river barge operators interested in carrying tanks on barge decks? Has anyone considered using rivers?

Charles Wilhelm (A. E. Staley Mfg. Co.) - We load barges regularly at Havana, Illinois and move them down to New Orleans. To my knowledge, the LASH steamship lines, LYKES and CENTRAL GULF, don't have tank trailers. I doubt that the LASH and SEABEE operators have constructed tank barges as yet. I think they will build them if there is sufficient potential but they have not as yet come to our attention. We've looked at the matter in concept in the past. I suppose if they had the tanks there would probably be a possibility of carrying them on deck. I know that the LASH/SEABEE barges are carrying some on the decks. I think it is just developing and the status tomorrow will be different from what it is today.

Mr. Armstrong Any comments on the East Coast LASH.

John Funke (Prudential Grace) - I think Mr. Wilhelm summed it up pretty well. The LASH tank barge is in the prototype design stage at the moment. There is no LASH operator today, to my knowledge that has a LASH tank barge in operation. This is one of the reasons why a number of us here on the East Coast are looking at the neoprene or rubber liner within the LASH barge in order to give the barge a liquid tank capability in one direction and dry cargo capability in the other.

John Carnes (MarAd - Central Region) - To my knowledge, there are no tank barges at all with the exception of prototypes. SEABEE, however, has done some exploratory work and that's been done on a liner. Their barge has some capability for carrying containers on pedestals at the upper part of the barge and they envision with UNIROYAL the possibility of big tanks which would behave like a deep tank and could be folded up.

Mr. Funke We have experienced excellent success with dry bulk in the double hull LASH barge that we operate today. We handle a great deal of dry bulk.

Mr. Lou Baltz (Heublein Inc.) The primary reason I came today was in reference to the new markets in Russia. Over the past few months I have been trying to get a tank container spotted in an Iron Curtain country, and no one was even interested in talking about this. I wondered if you are planning to expand your markets or have any plans to go into the Iron Curtain countries.

Gene Binda (Sea-Land Service, Inc.) - We're working very closely with the Iron Curtain countries right now. We haven't put any equipment in that area but I think within the next six months to a year you will find us operating there. At least our company is looking into it.

Mr. Armstrong That is with tank equipment.

Mr. Binda Yes, with tank equipment.

Robert Murphy (U.S. Lines) I would just like to add here that we do operate into the Iron Curtain countries with dry boxes at the moment. Our inventory of tank containers is not as great as Sea-Land's and therefore, we would not be in a position to offer that kind of service right at the moment. But it's not to say that we don't have an interest in it. I think the operation that we've been involved in with the Iron Curtain countries now has proven the fact that there is no difficulty moving equipment in and out. So it's more a matter of the operator who can come up with the equipment to spot in that area that can be of assistance to you.

Mr. Baltz Yes, I've found that in the past. As soon as we develop a new market the steamship lines immediately beat a path to our door. But when we are trying to develop the market its very difficult to come up with the equipment or come up with steamship companies that are willing to do this.

Mr. Armstrong We have got to get some of the marketing efforts coordinated here between government agencies, carriers, exporters particularly exporters. We've got enough trade developments going on in importing.

Mr. A. Black ADR regulations require the 20X8X8 ft. tanks of 3,000 gallons and over have to have a baffle. And IMCO drafts came out without a baffle. These tanks being made for European steamship operators do not have baffles. ADR still has the regulations; IMCO dropped it. What are your thoughts on baffles in 20 ft. tanks.

Capt. Schwing There have been a lot more design tests so we have a better understanding now of how design variations will affect performance. It's been fairly well established that where tank containers move in an almost full condition baffles are no longer necessary; IMCO no longer requires them either. We hope to ease ADR in this direction also. They're a little stubborn about changing. But hopefully they will respond.

Mr. Botkin

Can I interject one additional thought here? We were just doing some additional thinking about this overall problem of tank vehicle stability in another industry group. As a result of that, I started reviewing some of the historical test data that has been achieved over the years and I think that possibly one other avenue occurred to me for getting some more clout in ADR in order to get this baffle requirement taken out. In the first place, ADR, only requires baffles for first degree flammables which doesn't include whiskey or other alcoholic beverages if you read very carefully. The reason for that baffle requirement is probably like the earlier U.S. limitation on compartment sizes -- it was originally intended for filling station delivery. The concept was that the tank vehicle would start out fully loaded at 8:00 in the morning. At noon he was running around at half full, at 2:30 in the afternoon he was running around at a $\frac{1}{4}$ full etc. etc. Extensive road tests were run to compare stability of baffles versus non-baffled construction. Also you have the actual experience of the sea tests which have been done with tank containers over the years.

Mr. Binda

Containers being shipped today are filled to at least 70% capacity. In other words, you are not running half loaded containers around. In fact, most of them are practically 95% full.

Mr. Pennel

What happens if the tank container is not 70% loaded? Suppose you're down to about 50% of the capacity due to the high density of the product.

Mr. Binda

You just can't load it. We haven't loaded any trailers less than 70%. Its sort of an operating rule that we have accepted and gotten general concurrence on from the U. S. Coast Guard, not to load any trailer below 70% capacity. I think that is going to be put into the regulations eventually anyway. In other words, if you got a product that weighs 15 pounds per gallon you're going to have to build a trailer that can carry that capacity.

Mr. Pennel

Is this because of the supposed surge action?

Mr. Binda

There was a lot of testing done about 6 or 7 years ago on the inertia effect of the fluid inside the trailer. We determined at that time that it was best not to exceed an outage of 30%.

Mr. Pennel

Anything under 70% capacity of load creates a undue stress?

Mr. Botkin One of the big things that has to be kept in mind is that there is a very definite relationship between the fluidity or viscosity of a product and the surge you get out from it. I think for instance that with Mr. Wilhelm's extremely viscous corn syrup, you could have a tank loaded 50%, 90% or even 10% and you would never get any surge out of that thick stuff. Generally speaking, there are exceptions like the acetyl-tetra-bromide, but the vast majority of the commercially important commodities generally tend to be low in density so your tanks are going to be carried full. If you get a 10 lb. per gallon latex, which isn't a real fluid, the surge that real thin liquids presents doesn't build up as much.

Mr. Pennel Do I understand that there is an exception to this rule?

Mr. Wilhelm I was just going to mention that this corn syrup is 12 lbs. per gallon when it reaches the 40,000 lb. capacity we only have 3,300 gallons in the tank. Of course the viscosity is such that, as Mr. Botkin mentioned, there's going to be no surging at all. I expect that your heavier products are all that way.

Mr. Armstrong I think if we get down into that kind of a problem you'll find your carriers ready and willing to work it out.

David Letteney (Farrell Lines) - Do the standards permit an upgrading of the container gross load? In other words can we design a 20 ft. tank and have a 50,000 lb. gross which would give a little better load factor for denser liquids?

Mr. Grey We're talking about the standard gross load for 20 ft. containers which is 20 long tons or 44,800 lbs. If you try to exceed that by introducing a 50,000 lb. container or some other inflated figure then we will begin to run into handling problems. Every operator must know what kind of a loading he is going to get on his handling equipment. If you exceed the standard gross load then we run into an identification problem as well as a handling problem. You must find some means to tell a crane operator or a fork lift operator that he has a loading of 10% or 20% above his normal standard rated load. This is not the area for standards activity but an area where you must adopt a unique, customized design.

Mr. Botkin I concur with what Mr. Grey said. You do get into an area of specific design where purchase specification agreement is necessary. A number of 20 ft. tank containers have been made with a 30 ton gross weight rating. The

reason for this is that the physical strength of the handling gear and corner fittings etc. relate to the 30 ton gross weight rating. The tank capacity, approximately 5,000 gallons, was adequate to get into the 30 ton weight range.

- Mr. Wilhelm The axle weight limits for motor carrier highway operations prevent you from going much over 45,000 lbs. If you're operating within a port area, on a port-to-port basis sometimes axle limits are not a problem, but usually you are restricted from transporting greater loads by the highway weight limits.
- Mr. Letteney Of course, but you said yourself that you can transfer railroad tank cars at seaboard thereby avoiding highway limitations. Other shippers do the same.
- Mr. Wilhelm Well that would be considered house-to-house because you are loading an exterior point at the port, not at dockside.
- Mr. Letteney Well, what I am suggesting is that there are some possibilities here for denser cargo loading.
- Mr. Grey Dave, don't forget in standard container operations, the standard stacking number is 6 high. But if every one in the 6 was loaded -- 50% above its rated load, you get what amounts to an overloading of that cell and it probably could collapse. We're talking about a whole new ballgame if we accept higher gross loads -- so I would say that such a practice most definitely would be outside the standards realm.
- Mr. Armstrong What type of bottle should samples be kept in when sampling the product from a loaded tank container?
- Mr. Fazio (National Distillers Corp.) - Actually all one needs is an 8 oz. screw cap bottle that you can get at a local pharmacy. The bottle should be clean and rinsed out with the product, then filled and sealed and labelled.
- Mr. Armstrong When a tank container for dry products is to be loaded under pressure, what air pressure is to be used?
- Mr. Botkin Most of the tank containers hauling dry products now as reported by the Union Carbide experience are gravity unloaded, that is, they are not pressurized. There's no reason why they cannot be pneumatically unloaded. Normally, the air pressure would be in a range of about 10 to 15 psi. With some powders you might even want to run into a slightly higher pressure.

Mr. Armstrong

Mr. Grey. Have the discharge outlets of tanks been standardized?

Mr. Grey

No. We're going to try to put into the standard draft specification, a standard outlet of three inches for liquid tanks, and for dry bulkers a four inch outlet. This would be with a standard taper pipe thread.

SUMMATION

Eugene L. Binda
Director, Bulk Commodities Div.
Sea-Land Service, Inc.

It is a pleasure for me to be asked to present the summation of this AsTec Conference. What strikes me first is the fine cross-section represented here both in the panel of speakers and in the audience. This type of representation is important if progress is to be made in this field.

If I were to summarize the most significant contribution of this conference, it would be mutual understanding. This conference has illustrated virtually every facet of tank containers from construction to carriage including regulation and shipper experience. Given this exposure, each individual should have a better understanding of how his particular operation fits into the overall picture. More importantly, we should have acquired a better understanding of each other's operations and problems. This kind of knowledge is most important if we are to stimulate the growth and use of tank containers.

Each presentation has raised some key issues concerning the movement of tank containers, which deserve mention. For the marine operators, utilization is the key issue, because of the high cost of tank containers in relation to dry vans. This, coupled with the fact that the tank trade usually results in an empty back-haul, tends to make the economics of tank containers less profitable.

The shippers have indicated several factors which have a significant influence on their ability to use tank containers. One issue was the inadequate supply of tank containers and delays in positioning which can lead to costly penalties and loss of business. They also stressed the need to ensure that the tanks were properly cleaned prior to loading. It was shown that for tank containers to be economically feasible for shippers the service must be door-to-door. The use of overseas trans-loading facilities negates the benefits derived from using bulk shipments. Mr. Leonard noted an interest in

using tank containers for the Far East trade that has gone largely untapped due to the one-way nature of tank containers. This situation has forced carriers to impose rates that are uneconomical for shippers.

On the regulatory side, we have seen where efforts are being made to unify and consolidate existing codes and regulations both nationally and internationally. It was recommended that the design of tank containers be such that they will provide a truly intermodal vehicle.

The manufacturers have shown us that they can build a tank container that will fit virtually any shipping need. Also, a standard specification has been drafted which should provide a tank container that fits the requirements for intermodal carriage.

From the discussions heard today, I feel the overriding consideration is the utilization of tank containers. The problem of utilization is a function of several elements: the time associated with positioning and returning of the empty tank containers and the tendency of the tank trade to be a one-way haul. This last element is the area of crucial concern. If we turn our efforts to resolve this situation, we should find the use of tank containers changing from a selective basis as it is today to one of broader acceptance. To accomplish this, carriers and shippers must work together in order to find ways of obtaining more back-hauls. As the utilization of current equipment increases with a corresponding change in the profitability, we should find more equipment being ordered and the potential to give shippers better service at lower rates.

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